

Chapter 2

Development of Alternatives

2.1 INTRODUCTION AND BACKGROUND

This Draft Supplemental Environmental Impact Statement (DSEIS) has been developed using existing data to the maximum extent possible. The 1980 Final Environmental Statement (1980 FES) and the 1996 Final Supplement to the Final Environmental Statement (1996 FSFES) for the Animas-La Plata Project (ALP Project) analyzed in great depth the impacts associated with a project which had depletions three times those that are now being considered and whose purpose was largely irrigation. Within that previous analysis, considerable information exists regarding impacts associated with a much smaller project focusing on municipal and industrial (M&I) needs.

The objective of this DSEIS is to provide an evaluation of environmental and other critical factors to assist the Department of the Interior (Interior) and other involved parties in reaching a final settlement of the water claims of the Southern Ute Indian Tribe and the Ute Mountain Ute Tribe (Colorado Ute Tribes). ALP Project water would be used primarily for M&I purposes and would be allocated to the Colorado Ute Tribes and other designated water users. In order to complete an objective National Environmental Policy Act (NEPA) analysis of the Colorado Ute Tribal M&I water uses, which represent nearly three-fourths of the total project water allocations, projections of potential future M&I water uses were made for the Colorado Ute Tribes portion of ALP Project water. Likely sources of water were identified and a range of potential conveyance options was developed that would transport and/or store the water from these sources for these projected future uses.

Recognizing the reserved rights doctrine and Tribal sovereignty, the potential future water uses discussed in this DSEIS are non-binding on the Colorado Ute Tribes, and are intended to provide a range of the types of uses upon which ALP Project alternatives can be evaluated. Building on these projected non-binding future water uses, as well as analyses that have been done for previous NEPA documents, a broad range of alternatives was developed which incorporated both structural and non-structural elements.

This chapter describes the alternatives considered, the process by which the alternatives were analyzed, and the method used to refine alternatives in order to consider whether a particular alternative would secure an Indian water rights settlement. The adequacy of existing environmental data for each alternative was evaluated, and additional information gathered as necessary to make a complete analysis of each of the alternatives at a comparable level of detail. The alternatives were compared to the ALP Project purpose and need and their relative environmental impacts and technical and economic factors were also evaluated.

This chapter presents information on:

- Identification of future M&I water needs and uses
- Sources of water to meet needs and uses
- Overview of alternatives evaluated
- Evaluation of alternatives and selection of two refined alternatives for more detailed study

- o Components of the alternatives considered but eliminated from further consideration in this DSEIS
- o Description of alternatives selected for further refinement

2.1.1 Future Water Uses

The current purpose of, and need for the proposed ALP Project is to complete implementation of the Colorado Ute Indian Water Rights Settlement Act of 1988 (Settlement Act) by providing the Colorado Ute Tribes an assured long-term water supply as specified in the Settlement Act. Providing the Colorado Ute Tribes with an assured long-term water supply is necessary to protect existing water users from senior water rights claims by the Colorado Ute Tribes. The Colorado Ute Tribes could use this assured water supply to satisfy any future M&I water demands on their reservations and to provide water for future regional M&I needs.

In addition to providing an assured water supply as a settlement of the Colorado Ute Tribes' senior water rights, the ALP Project provides a dependable long-term water supply for neighboring Indian and non-Indian community water needs, including a portion of the Navajo Nation at and near Shiprock, New Mexico, the Animas-La Plata Water Conservancy District (ALPWCD), and the San Juan Water Commission (SJWC). About one-fourth of the ALP Project water would be allocated to the Navajo Nation, the ALPWCD, and the SJWC to serve their identified regional growth and planned M&I needs. See **Table 2-1** for a listing of ALPWCD, SJWC, and Navajo Nation future uses.

Table 2-1 Summary of Future Uses of M&I Water by the Navajo Nation, ALPWCD, and SJWC		
Category of M&I Use	Diversion from the San Juan River Basin (acre-feet/year (afy))	Depletion from the San Juan River Basin (afy)
Navajo Nation	4,680	2,340
Animas-La Plata Water Conservancy District	5,200	2,600
San Juan Water Commission	20,800	10,400
Total	30,680	15,340

The ultimate use of the remaining project water (about three-fourths of the total water supply) by the Colorado Ute Tribes would be more specifically defined by those Tribes as future needs develop. Therefore, a range of potential future water uses was developed. The specific percentage allocation between the Colorado Ute Tribes and other project beneficiaries may not be fixed, however, as noted in Chapter 1. Comments received during scoping, and in legislation recently introduced by non-federal parties (i.e., HR 3112), indicate that the Colorado Ute Tribes may agree to a reallocation of 6,010 acre-feet/year (afy) to the State of Colorado and entities in New Mexico. A change of that magnitude in the overall allocation of project water may not be significant to the analysis contained herein (other than cost allocation), since a significant amount of the expected use of Tribal water would be for regional water needs (e.g., leasing).

Actions which would trigger future NEPA compliance activities when future water uses are implemented are defined in Sections 2.1.1.1, 2.1.1.2, and 2.1.1.4.

2.1.1.1 Future Water Uses of the Navajo Nation, ALPWCD and SJWC

Based on the August 11, 1998 Administration Proposal for Final Implementation of the Colorado Ute Water Rights Settlement (Administration Proposal), the Navajo Nation, ALPWCD, and SJWC would annually receive 30,680 acre-feet (af) (representing 15,340 afy of depletion) of water from the ALP Project. (Please refer to the Glossary for a definition of diversion and depletion as it applies to this project.) This represents about one-fourth of the total annual allocations from the ALP Project of 111,965 af (57,100 afy depletion).

As shown in Table 2-1, the Navajo Nation would receive 4,680 afy (2,340 afy depletion) and would use it to serve the M&I requirements of the Shiprock, Cudei, Hogback, Nenahnezad, Upper Fruitland, San Juan, Sanostee, and Beclaibito Chapters in the Shiprock, New Mexico area. A new water pipeline, the Navajo Nation Municipal Pipeline (NNMP), is proposed for construction to deliver this water to these eight Navajo Nation chapters, replacing the existing pipeline between Farmington and Shiprock. The 4,680 afy represents about one-half of the future projected M&I requirements of these chapters, based on a 40-year projection. The NEPA evaluation of the proposed NNMP is included as part of this DSEIS (see Section 2.5.1.3.3).

The ALPWCD projects growth of M&I water needs in the Durango, Colorado area (Gronning 1994), based on the continued increase in population up to 30,000 to 40,000 people in its service area. Water allocations of 5,200 afy (2,600 afy depletions) from the ALP Project would supplement existing water supplies and would either be diverted from the Animas River upstream of Durango, conveyed from the Florida River Basin, or conveyed from an ALP Project reservoir at Ridges Basin. Improvements to pumping plants and water treatment facilities and development of additional storage have been evaluated and would likely be required. Development of the Horse Gulch Reservoir has been studied by the City of Durango as one specific facility for water storage. Enhancement of water delivery infrastructures would also be required to serve new residential, commercial, and industrial sectors. Future development of facilities to serve the City of Durango and other ALPWCD M&I water users would potentially be the subject of future NEPA compliance if a federal action were involved.

The SJWC has identified water use needs and projected M&I growth in its service area, including the Cities of Aztec, Bloomfield, and Farmington, New Mexico (Cielo 1995). Under the ALP Project allocations, the SJWC would receive 20,800 afy (10,400 afy depletion), which would meet a portion of its projected water needs. The SJWC currently has a number of permitted diversions from the San Juan and Animas Rivers to supply its M&I requirements. ALP Project water would be similarly diverted from the Animas and San Juan Rivers, using existing diversion, pumping, and storage facilities. Water could also be stored in the Navajo Reservoir for SJWC uses. Future development of facilities to serve the Cities of Aztec, Bloomfield, and Farmington and other SJWC water users would potentially be the subject of future NEPA compliance, if a federal action were involved.

2.1.1.2 Colorado Ute Tribal Future Water Uses

This section discusses the projections for future M&I water uses by the Colorado Ute Tribes. These future uses would be the subject of future NEPA review at the time the uses are determined. Structural components would be designed to convey water to those uses. Chapter 3, Affected Environment and Environmental Consequences, discusses the affected environment and potential environmental impacts

associated with these potential future water uses to the extent it is possible to identify them at this time. Specific engineering, environmental, and cost analysis would be conducted in the future for those future water uses and conveyances that are proposed for implementation.

The Ute Tribal Water Use Study (Dornbusch 1999) (see Technical Appendix 1) identified several non-binding end uses that could be employed by the Colorado Ute Tribes. This study did not fully allocate all of the Colorado Ute Tribes ALP Project water. Further studies (Riley 1999a, Bliesner 1999a) projected regional M&I water uses in the event that the Colorado Ute Tribes elect to lease or sell a portion of their ALP Project water to other users. The report by Dornbusch includes examples for the types of water uses listed below. These uses are illustrated on **Map 2-1**.

- Municipal water use
- Industrial park
- Recreation and tourism development
- Energy development
- Livestock and wildlife water use¹
- Regional municipal water supply

2.1.1.2.1 *Municipal Water Use*

Population growth between 1970 and 1990 approached 3 percent per year on both the Southern Ute Indian and Ute Mountain Ute Reservations. However, more recently, the enrollments of both Tribes have been increasing approximately 1.3 percent to 1.5 percent per year. The Census Bureau anticipates that Colorado's American Indian population will grow at an average annual rate of 1.9 percent per year through the year 2025 and then decline to 1.1 percent per year by 2065. Based on these growth rates, the population of the Colorado Ute Tribes is expected to increase from 3,287 in 1998 to approximately 15,000 by the year 2100.

A housing shortage currently exists on both Colorado Ute Tribe reservations. To satisfy the existing housing shortage and to accommodate future growth, the Southern Ute Indian Tribe may choose to locate one 200-housing unit development in each of three areas, for a total of 600 housing units. One would be located near Colorado State Highway 172 on Florida Mesa, one in the La Posta area of the Animas River Basin, and the third in the Red Mesa area of the La Plata River Basin. Correspondingly, the Ute Mountain Ute Tribe may elect to satisfy the demands for housing on its reservation by constructing a 400-housing unit in the southeastern corner of the Colorado portion of the Ute Mountain Ute Reservation.

2.1.1.2.2 *Industrial Park Water Use*

The Southern Ute Indian Reservation lies just south of the City of Durango. The City of Durango is growing and, as a result, the demand for industrial park space is increasing. The Southern Ute Indian Tribe owns land in proximity to Durango and may want to lease part of its reservation land for an industrial park. This would require that water be made available.

¹For purposes of this project, M&I refers to water for industries and cities, as well as for livestock and wildlife uses, recreation, and tourism development.

Map 2-1 Possible Locations of Colorado Ute Tribe Non-Binding M&I Water End Uses

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2.1.1.2.3 *Recreation and Tourism Development Water Use*

Both Colorado Ute Tribal reservations are located in a scenic area that is a popular tourism destination. The proximity of the Southern Ute Indian Reservation to the City of Durango would allow the reservation to take advantage of the established flow of tourists and help draw visitors to reservation facilities. One possibility would be to construct a resort hotel complex including a golf course and casino.

The Ute Mountain Ute Reservation, although farther from the Durango tourist area than the Southern Ute Indian Reservation, is adjacent to Mesa Verde National Park. This presents an opportunity to establish a tribal visitor center, with a resort hotel and golf course, to cater to visitors who are drawn by the unique collection of ancient sites in the area. In addition, the Ute Mountain Ute Tribe recently purchased 20,000 acres of land in the La Plata River Basin, providing an opportunity to develop a dude ranch.

2.1.1.2.4 *Energy Development Water Use*

Both reservations lie in the San Juan Basin of southwestern Colorado and northwestern New Mexico. The San Juan Basin contains large coal, oil, and gas reserves and is the location of three operating coal mines and many oil and gas wells. The Southern Ute Indian Reservation is situated over approximately 16 billion tons of Fruitland Formation coal, about 500 million tons of which lies within 500 feet of the surface. The Ute Mountain Ute Reservation overlies Fruitland Formation coal deposits as well. Because of the associated economies of scale, approximately 14.4 million tons of coal offers potential for strip mining if combined with adjacent off-reservation deposits.

The Colorado Ute Tribes' energy resources offer several opportunities for development. Tribal coal could be mined and shipped off the reservations to fuel power plants. Tribal coal and/or gas could be burned in on-reservation power plants, and the electricity generated could be transmitted to the regional power grid. All of these opportunities would require water. Surface mining requires water for dust suppression and land reclamation. Coal or gas-fired power plants typically use water for cooling, as would a coal gasification plant. A coal slurry pipeline would mix pulverized coal with water and pipe the resulting slurry.

2.1.1.2.5 *Livestock and Wildlife Water Use*

Both Colorado Ute Tribal Reservations contain large areas of rangeland, but the use of this rangeland is limited by the scarcity of developed water sources. Livestock operators could make more effective use of the rangeland if additional watering facilities were installed. In addition, using some of their water to help sustain wildlife is important to the Colorado Ute Tribes. The Colorado Ute Tribes would be interested in providing watering facilities for wildlife, especially where pipelines could be tied into the delivery systems established for other uses on the reservations.

2.1.1.2.6 *Regional Municipal and Industrial Water Supply*

Just as the entire West is growing, the San Juan River Basin is experiencing its own population growth. This growth will increase the demand for water, both for household use and for the commercial, industrial, recreational, and community infrastructure needs that accompany population growth.

Dornbusch (1999) displays how population in the three-county area (La Plata and Montezuma Counties in Colorado and San Juan County in New Mexico) has changed between 1970 and 1998. La Plata County population doubled in that time period, and the population of Montezuma and San Juan Counties has nearly doubled. **Figure 2-1** graphically depicts this information. The regional water use is computed from the population growth using the nationwide average domestic water use of 179 gallons per capita per day.

Figure 2-1. Regional Population and M&I Water Needs (La Plata, Montezuma and San Juan Counties)

2.1.1.2.7 *In-Stream Leasing*

In addition to the above uses of water identified in Dornbusch (1999c), the Colorado Ute Tribes could elect to leave project water in one or more of the streams or rivers in the project area, and lease it for enhancement of in-stream values. For example, the Ute Mountain Ute Tribe could elect to negotiate lease terms to release water into the Dolores River to benefit fisheries .

2.1.1.3 Summary of Municipal and Industrial Water Uses by Colorado Ute Tribes and Other ALP Project Beneficiaries

Table 2-2 contains a summary of projected M&I water uses and depletions by the Colorado Ute Tribes and other ALP Project beneficiaries.

Table 2-2 Summary of Future Uses of M&I Water by Colorado Ute Tribes and Other Project Beneficiaries		
Category of M&I Use	Diversion (afy)	Depletion (afy)
Non-Binding M&I Use by Southern Ute Indian Tribe		
Florida Mesa Housing	140	70
Animas River Basin Housing	140	70
La Plata River Basin Housing	140	70
Animas Industrial Park	40	20
Ridges Basin Golf Course	796	398
Ridges Basin Resort	44	22
Coal Mine	830	415
Coal-Fired Power Plant	27,000	13,500
Livestock and Wildlife	30	15
Southern Ute Indian Tribe Total	29,160	14,580
Non-Binding M&I Use by Ute Mountain Ute Tribe		
La Plata Housing	280	140
Mancos Canyon Golf Course	978	489
Mancos Canyon Resort	33	17
La Plata Basin Resort	4,600	2,300
La Plata Basin Golf Course	40	20
La Plata Basin Dude Ranch	30	15
Gas-Fired Power Plant	626	313
Livestock and Wildlife	10	5
Ute Mountain Ute Tribe Total	6,597	3,299
Non-Binding Regional M&I Water Supply Demand		
Durango, Colorado	15,338	7,669
Bloomfield, New Mexico and Upstream	4,533	2,267
Farmington, New Mexico	28,373	14,187
Florida Mesa, Colorado	7,016	3,508
Red Mesa Plateau, Colorado or Cortez, Colorado	2,105	1,052
Kirtland, New Mexico	7,016	3,508
Aztec, New Mexico	4,911	2,456
Less ALPWCD Allocation	(-5,200)	(-2,600)
Less SJWC Allocation	(-20,800)	(-10,400)
Total Regional Supply	43,292	21,646
Total Colorado Ute Tribes Settlement	79,050	39,525

Table 2-2 (continued)		
Summary of Future Uses of M&I Water by Colorado Ute Tribes and Other Project Beneficiaries		
Category of M&I Use	Diversion (afy)	Depletion (afy)
Other Binding Uses		
Navajo Nation	4,680	2,340
ALPWCD	5,200	2,600
SJWC	20,800	10,400
Estimated Operational Losses	2,235	2,235
Total for Other Uses	32,915	17,575
Total Water Use	111,965	57,100*
Source: Dornbusch 1999; Riley 1999a; Bliesner 1999a. In addition to the 57,100 afy depletion, the Colorado Ute Tribes are entitled to another 13,000 afy of depletion under the Colorado Ute Indian Water Rights Final Settlement Agreement (Settlement Agreement). These additional depletions could come from the purchase of land and water rights and would follow a historical depletion pattern which would not result in any additional depletions above the 57,100 afy.		

2.1.1.4 Future Environmental Compliance

This DSEIS addresses the settings, likely impacts, and proposed mitigation measures for structural and non-structural components of alternatives. While these aspects of the proposed structural components are well defined, the non-structural components, as well as future water uses, are projections. The specific uses to which a water acquisition fund may be put by the Colorado Ute Tribes in implementing the non-structural components would be determined in the future. It may include acquisition of land and associated water rights, or other activities appropriate to the use of this fund. The range of impacts would vary depending on these future uses. Similarly, the future water use projections are made for the purpose of comparative NEPA analysis, based on reasonable assumptions at this time. The future water uses described in this DSEIS are non-binding on the Colorado Ute Tribes, and the actual future use of water may vary.

The projections are reasonable and representative of what is likely to occur, as far as current information allows. Any conveyance of water out of storage via pipeline or other means (e.g., as in the Ridges Basin Reservoir in Alternative 4, or from Lemon Reservoir in Alternative 6) to the Colorado Ute Tribes, or to the Navajo Nation, ALPWCD, and/or the SJWC, would be a projected future action. Any acquisition of land and water rights, or development of a future water use (e.g., construction of housing on the Colorado Ute Tribe Reservations), would also be considered projected future actions.

Any future actions would be subject to future environmental review, and NEPA compliance would be required as part of any approval by a federal agency. The following federal actions would serve as triggers for future NEPA compliance activities. In addition, other federal and state regulatory and environmental requirements would have to be met in implementation of future actions (e.g., compliance with the Endangered Species Act (ESA) and Clean Water Act (CWA)).

2.1.1.4.1 *Conveyance and Use of Water Associated With Structural Components*

Most of the alternatives include a mechanism for storing water to allow for the assured supply of water which is a necessary component of an M&I water supply. The range of storage facilities in the various alternatives included, for example, construction of a new reservoir at Ridges Basin or the Aztec site, modification and storage of water in Lemon Reservoir or Red Mesa Reservoir, and storage and re-operation of other existing storage facilities (e.g., Jackson Gulch Reservoir, Navajo Reservoir). These structural components are defined in this DSEIS.

Since possible future water uses are non-binding, the representative environmental impacts of conveyance of water from these storage reservoirs to ultimate end uses were assessed to the extent reasonable and feasible. However, no specific conveyance systems were engineered, nor were any specific water use impacts (e.g., from construction and operation of new Colorado Ute Tribal housing areas or expansion of the City of Durango water supply system) identified. As implementation of any or all of these future water uses is proposed by the various users of the project water, they would be subject to future NEPA review as part of the following triggering federal actions:

Future Non-Binding Water Uses by Colorado Ute Tribes

Several of the alternatives include the construction and operation of a storage reservoir at Ridges Basin as a structural component. The Colorado Ute Tribes would be provided a specific amount of water in Ridges Basin Reservoir or at a point on the Animas River where diversions are made to the Durango Pumping Plant. As provided in the Settlement, the United States will bear the annual operation, maintenance, and replacement (OM&R) costs allocable to the Tribes' water allocation until the water is first used either by a Tribe or pursuant to a water use contract with the Tribe. Interior anticipates it would use a contracting mechanism to administer the establishment of such use of water by the Tribes. These block notices would provide a description of the quantity of water, the planned use, and conveyance method along with an assignment of an appropriate amount of OM&R costs. These specific uses would undergo an appropriate level of environmental impact analysis on a case-by-case basis by Interior prior to approval.

Future Water Uses by Animas-La Plata Water Conservancy District

The structural components that include Ridges Basin Reservoir and associated Durango Pumping Plant would include provisions to allow the City of Durango (through the ALPWCD) to pump water from the Animas River directly into the City's terminal reservoir. The ALP Project's structural components do not, however, provide the pipeline to connect the pumping plant to the City's existing raw water line that conveys water to its terminal reservoir. The ALP Project also would provide a blind flange or valve within the outlet works of Ridges Basin Dam for future connection by the City of Durango to obtain water stored in Ridges Basin Reservoir. The necessary pipeline to connect to this flange or valve to allow the City to use this stored water would be the City's responsibility.

In either of the above cases, Interior would require the City to provide sufficient design details of its proposed connection to federal facilities before the connections can be made. This design review and approval would be the initiating action for subsequent environmental impact analysis by Interior prior to any approval.

Future Water Uses by the San Juan Water Commission

The structural component of most alternatives would provide storage for the SJWC, but would not provide additional diversion or conveyance facilities within its system. Facilities currently exist to allow the SJWC users to divert ALP Project water into their systems. Any subsequent enlargement or extension of the diversions, treatment, or conveyance and delivery pipelines would not necessarily entail a federal involvement if CWA compliance is not required. Any environmental impact analysis associated with such enlargements or extensions would most likely be under the purview of the State of New Mexico.

Future Water Uses by the Navajo Nation

A structural component of the ALP Project would provide storage and a conveyance pipeline for ALP Project water for the Navajo Nation. Any enlargement or extension of the Navajo Nation's delivery system connected to the NNMP (see Section 2.5.1.3.3) would most likely be under the purview of the Navajo Nation and the Bureau of Indian Affairs (BIA), and appropriate environmental review would be required prior to approval.

2.1.1.4.2 *Conveyance and Use of Water Associated With Non-Structural Components*

Most of the ALP Project alternatives considered include a non-structural component which would establish a water acquisition fund to allow the Colorado Ute Tribes to purchase land and water rights, or to develop the economy on their reservations. This DSEIS discusses a range of scenarios involving acquisition of land and water rights, and the likely projected environmental impacts. The possible uses of funds from a water acquisition fund by the Colorado Ute Tribes are non-binding. However, there are triggers involved which would initiate NEPA, the ESA, and other environmental reviews when funds are used.

A water acquisition fund would likely be a trust account established within Interior. Interior's procedures would require that any applications by the Colorado Ute Tribes for funds from this account include a development plan. This plan would discuss what the funds would be used for, how and where they would be used, and what the potential environmental impacts would be. If the funds would be used for purchase of lands and water rights, a water use plan would be required as part of the development plan. The water use plan would include information on whether the water would remain on the land or if it was proposed to remove the water from the land and convey it elsewhere for use.

The development plan and the application for funds would be reviewed by the appropriate office of Interior, and then forwarded with recommendations to the Secretary of Interior for final approval. Any NEPA compliance activities (e.g., categorical exclusion, preparation of an environmental assessment (EA) or environmental impact statement (EIS)) would be conducted by Interior prior to Secretarial approval.

Any transfer of water from the land and use for a purpose different from the current use would also require the review and approval of the State of Colorado or the State of New Mexico.

2.1.2 Sources of Water

The projections of future water uses were based on surveys of the Colorado Ute Tribes and their plans for economic and social development on their reservations. The future water uses to meet M&I growth needs for the areas served by the SJWC, the ALPWCD, and the Navajo Nation were also considered. The ultimate development of water uses would be initiated by the users as they determine what is in the best interests of their constituents.

Building on this analysis, the water consumption associated with each use was determined (see **Table 2-3**). The primary and secondary sources of surface water to provide these volumes were identified, storage areas were designated, and conveyance options were routed. Table 2-3 also identifies the likely primary sources of water for the future water use options. The general locations of these potential water sources are shown on Map 1-1 in Chapter 1.

The volumes of water that the projected future water uses would require were considered, as well as the water available in the ALP Project area to supply those uses. Previous evaluations of potential water sources in the ALP Project area considered groundwater supplies, making volumes available through water conservation, surface water supplies, and the potential of purchasing water rights (1996 FSFES 404(b)(1) Evaluation). This evaluation has been augmented by (1) a review of potential water availability through the purchase of water rights and land in the project area; (2) water conservation on the Pine, Florida, and Dolores Rivers; (3) expanding storage in Lemon Reservoir; (4) allocation of water in McPhee Reservoir, and (5) other evaluations. The most likely sources of reliable supplies of water for these non-binding uses include:

- Water from the purchase of water rights on McElmo Creek, Navajo Wash, and/or the Mancos, La Plata, Animas, Florida, and/or Pine Rivers, with subsequent diversion and conveyance to the area(s) of use, with possible storage at the point of use;
- Water diverted from the San Juan River and conveyed to the area(s) of use; and/or
- Water diverted from the Animas River, stored in a reservoir(s), and conveyed to the area(s) of use.

For the purposes of this analysis, water would either be conveyed in the source river or stream to the point(s) of use or would be conveyed in a pressurized pipeline. Open canals were deemed inappropriate because of inefficiencies in delivery and because the water would be used for M&I purposes.

In the evaluation of non-structural components of several alternatives (Section 2.3.2), assumptions were made about land and water rights acquisitions made by the Colorado Ute Tribes. The purchase of water rights is subject to Colorado and New Mexico water law. A further discussion of water rights considerations and constraints is included as Attachment D, Water Rights Considerations and Constraints, Land Acquisition Analysis, M&I Water Use Valuation, and Conversion of Fee Simple Farmland.

Table 2-3 Potential Water Sources to Meet Use Requirements		
Water User	Future Water Use	Primary Water Source(s)
Southern Ute Indian Tribe	Florida Mesa (Highway 172) Housing	Florida, Animas, Pine Rivers
	Animas Basin (La Posta) Housing	Animas River
	La Plata Basin (Red Mesa) Housing	Animas River
	Animas Industrial Park	Animas River
	Ridges Basin Golf Course	Animas River
	Ridges Basin Resort	Animas River
	Coal Mine	Animas, San Juan Rivers
	Coal-Fired Power Plant	Animas, San Juan Rivers
	Livestock and Wildlife	Animas, Florida, Pine Rivers
Ute Mountain Ute Tribe	La Plata Basin Housing	Animas, La Plata Rivers
	Mancos Canyon Golf Course	Animas, Mancos Rivers
	Mancos Canyon Resort	Animas, Mancos Rivers
	La Plata Basin (Hesperus) Resort	Animas, La Plata Rivers
	La Plata Basin (Hesperus) Golf Course	Animas, La Plata Rivers
	La Plata Basin (Hesperus) Dude Ranch	Animas, La Plata Rivers
	Gas-Fired Power Plant	San Juan River
	Livestock and Wildlife	Mancos, La Plata, Animas Rivers
Colorado Ute Tribes	Durango - M&I Lease or Sale	Animas, Florida Rivers
	Bloomfield - M&I Lease or Sale	San Juan River
	Cortez - M&I Lease or Sale	Dolores River
	Farmington - M&I Lease or Sale	Animas, San Juan Rivers
	Florida Mesa - M&I Lease or Sale	Florida, Animas Rivers
	Red Mesa Plateau - M&I Lease or Sale	Animas River
	Kirtland - M&I Lease or Sale	San Juan River
	Aztec - M&I Lease or Sale	Animas, San Juan Rivers
Navajo Nation	Navajo Nation Shiprock Tribal Use	Animas, San Juan Rivers
ALPWCD	M&I Uses	Animas River
SJWC	M&I Uses	Animas, San Juan Rivers

2.2 OVERVIEW OF ALTERNATIVES EVALUATED

This section provides an overview of the alternatives evaluated in this DSEIS, including alternatives developed during the Romer-Schoettler process, public scoping meetings, and in consultation with project stakeholders.

2.2.1 Alternatives Described in *Federal Register* Notice to be Addressed in the Draft Supplemental Environmental Impact Statement

On January 4, 1999, the *Federal Register* included a Notice of Intent (NOI) by Reclamation to prepare a DSEIS. The NOI announced that public meetings would take place to receive public input on eight alternatives, including the proposed action (the Administration Proposal, including both its structural and non-structural components), a no action alternative, four structural alternatives (i.e., involving construction of a new reservoir), and two non-structural alternatives, as described below:

- Administration Proposal, consisting of a structural element (Ridges Basin Reservoir with a 90,000 af capacity) and a non-structural element (purchasing water rights for 13,000 af of depletion)
- Administration Proposal with recreational element added, increasing the overall reservoir size to approximately 120,000 af
- Animas-La Plata Reconciliation Plan (Romer-Schoettler structural alternative as represented by the legislation introduced during the 105th Congress (S.1771 & H.R. 3478))
- Animas River Citizens Coalition Conceptual Alternative (Romer-Schoettler non-structural alternative)
- 1996 FSFES Recommendation Plan
- Administration Proposal with alternative water supply for non-Colorado Ute Tribe entities (i.e., Navajo Nation, ALPCWD, and SJWC)
- Citizens Progressive Alliance Alternative (instream leasing coupled with other non-structural alternatives)
- No Action Alternative

2.2.2 Alternatives and Project Issues Identified in Public Scoping Meetings

Scoping meetings were held on February 2, 1999, in Durango, Colorado; February 3, 1999, in Farmington, New Mexico; and February 4, 1999, in Denver, Colorado (see Chapter 6, Consultation and Coordination, for more information on the scoping meetings). As a result of these scoping meetings, two additional alternatives were added:

- Administration Proposal, with a pumping regimen consistent with the San Juan River Basin Recovery Implementation Program (SJRBRIP) (approximately 105,000 af of storage); and
- Administration Proposal with a pumping regimen consistent with the SJRBRIP and an inactive pool for water quality, recreation, and fisheries at Ridges Basin (approximately 135,000 af of storage).

During the development of the 1980 FES and 1996 FSFES, several additional alternative dam sites were evaluated before Ridges Basin was selected as the preferred reservoir site. Due to comments raised during scoping, and because the current ALP Project would be down-sized, a re-evaluation of these dam sites in this DSEIS was performed to determine if any of these sites could meet the purpose and need that would be provided by storage at Ridges Basin Reservoir. These dam and diversion sites are listed below and were evaluated to assess whether they could meet the same purpose as Ridges Basin (see Section 2.4.2).

- Howardsville Dam and Reservoir Site
- Purgatory Dam and Reservoir Site
- Teft Diversion Site
- Bondad Dam and Reservoir Site
- Cedar Hill Dam and Reservoir Site

In addition, the Administration Proposal with an alternative water supply for the ALPWCD, SJWC, and the Navajo Nation includes a provision that the water would be provided from sources other than Ridges Basin. Therefore, a proposed reservoir site near Aztec, New Mexico was also evaluated to determine if it could meet this purpose. **Table 2-4** is a summary of these structural alternatives to Ridges Basin Dam and Reservoir. **Map 2-2** shows the general location of the dams and the diversion site.

<p>Table 2-4 Summary of Structural Alternatives to Ridges Basin Dam and Reservoir</p>			
Site	Water Source	Type of Facility	Active Capacity or Diversion Capacity
Howardsville	Animas River	Dam located on Animas River about 3 miles north of Silverton, Colorado	75,000 af
Purgatory	Cascade Creek and Animas River	Dam located on Cascade Creek about 1.5 miles upstream of confluence with Animas River	105,000 af
Teft Diversion	Animas River	Diversion dam located on the Animas River downstream of the confluence with Cascade Creek	240 cubic feet per second (cfs)
Bondad	Animas River	Dam located on the mainstem of the Animas River about 16 miles downstream of Durango	100,000 af
Cedar Hill	Animas River	Dam located on the mainstem of the Animas River about 24 miles downstream of Durango	101,000 af
Aztec Reservoir ^a	Animas River	Off-stream dam located about 28 miles downstream of Durango	20,000 af
<p>^aAztec Reservoir would not be a replacement for Ridges Basin Reservoir. The purpose of Aztec Reservoir is to supply water for entities in New Mexico and would result in a smaller Ridges Basin Reservoir of approximately 75,000 af.</p>			

Table 2-5 presents a summary of the 10 alternatives in terms of water supplied, size of storage facilities required, and whether the alternative is structural or non-structural. For ease of identification, the alternatives have been assigned numbers from 1 through 10. This table is provided to assist the reader in gaining a better understanding of the relative differences among these alternatives.

Map 2-2 Potential Water Storage Locations

[back page of Map 2-2]

<p align="center">Table 2-5 Summary of Alternatives</p>							
Alternative	Reservoir Size (Ridges Basin)	Supplies M&I Water to Colorado Ute Tribes and Navajo Nation	Supplies M&I Water to Non-Indians	Supplies Irrigation Water	Provides Federal Funds to Buy Existing Land and Water Rights	Provides a Revenue Stream to Project Beneficiaries for Undiverted Water	Modify Existing Projects to Provide Water
Alternative 1 Administration Proposal	90,000 af	19,980 afy depletion to each Colorado Ute Tribe and 2,340 afy depletion to Navajo Nation	2,600 afy depletion to ALPWCD and 10,400 afy depletion to SJWC	No	\$40 million to the Colorado Ute Tribes	No	No
Alternative 2 Administration Proposal with Recreation Element Added	120,000 af	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1
Alternative 3 Administration Proposal With SJRBRIP Element Added	105,000 af	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1
Alternative 4 Administration Proposal With SJRBRIP Element and Recreation Element Added	135,000 af	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1
Alternative 5 Animas-La Plata Reconciliation Plan	260,000 af	16,525 afy depletion to each Colorado Ute Tribe and 2,340 afy depletion to the Navajo Nation	Same as described under Alternative 1	5,230 afy depletion in Colorado and 780 afy depletion in New Mexico	No	Same as described under Alternative 1	Same as described under Alternative 1
Alternative 6 Animas River Citizens Coalition Conceptual Alternative	No reservoir	Water from purchase of lands with existing water rights No water for Navajo Nation	Providing water will be responsibility of local entities	Same as described under Alternative 1	\$113 to \$158 million provided to the Colorado Ute Tribes to purchase existing water rights	Same as described under Alternative 1	Yes. Modification to Pine, Florida, and Dolores Projects
Alternative 7 1996 FSFES Recommended Action	274,000 af	Same as described under Alternative 1	4,600 afy depletion to ALPWCD and 15,400 afy depletion to SJWC	56,100 afy depletion to ALPWCD and 8,800 afy depletion to ALPWCD	No	Same as described under Alternative 1	Same as described under Alternative 1

Table 2-5 (continued)
Summary of Alternatives

Alternative	Reservoir Size (Ridges Basin)	Supplies M&I Water to Colorado Ute Tribes and Navajo Nation	Supplies M&I Water to Non-Indians	Supplies Irrigation Water	Provides Federal Funds to Buy Existing Land and Water Rights	Provides a Revenue Stream to Project Beneficiaries for Undiverted Water	Modify Existing Projects to Provide Water
Alternative 8 Administration Proposal With an Alternative Water Supply for Non- Colorado Ute Indian Entities	Ridges Basin 75,000 af Aztec 20,000 af	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1	Same as described under Alternative 1
Alternative 9 Citizens Progressive Alliance Alternative	No reservoir	Possibility. Entities must finance development using their revenues. Revenues would be reduced in proportion to amount of water developed.	Possibility. Entities must finance development using their revenues. Revenues would be reduced in proportion to amount of water developed.	Possibility. Entities must finance development using their revenues. Revenues would be reduced in proportion to amount of water developed.	Possibility. Colorado Ute Tribes must finance out of their revenues. Revenues would be reduced in proportion to amount of water developed.	Yes, revenue stream derived from opportunity costs (avoiding costs) from hydropower, salinity control, endangered species, and operation, maintenance, and administrative costs.	Possibility
Alternative 10 No Action Alternative	No	No	No	No	No	No	No

2.3 EVALUATION OF ALTERNATIVES

A plan of approach was developed that described how the NEPA process was to proceed (refer to Chapter 6 for more information). All alternatives underwent an initial threshold assessment to identify those that were capable of meeting the ALP Project's purpose and need. All alternatives appeared to have the potential to meet the ALP Project's purpose and need, and they were all then evaluated against the following criteria: (1) an evaluation of environmental impacts of all alternatives, (2) an evaluation of the degree to which each alternative met the purpose and need and contained the elements necessary to secure an Indian water rights settlement, and (3) an evaluation of the technical and economic merits.

2.3.1 Alternatives Evaluation Process

Building on the identification of a range of future water uses and an evaluation of potential water sources in the region, alternatives were identified that had the ability, in whole or in part, to provide water to the Colorado Ute Tribes in fulfillment of the Settlement Act. These alternatives included the alternatives evaluated in the 1996 FSFES, those identified by Reclamation in the January 1999 NOI, alternatives suggested during the February 1999 public scoping meetings, and a combination of the structural and non-structural components of all of these alternatives.

2.3.1.1 Evaluation of Existing Data and Data Collection

Existing base resources and information about each of the alternatives were evaluated to determine if sufficient information (e.g., baseline information, data and analyses, previous NEPA documents, proponent information, agency baseline data, and other third-party studies) was available in order to:

- Locate the alternative's features, its size and relationship to other alternatives;
- Describe the existing environment that would be impacted by implementation of the alternative's features;
- Describe the environmental impacts that would likely occur as a result of implementing the alternative;
- Characterize the technical and economic features of the alternative; and
- Address issues raised at the scoping meetings and during agency review.

The assessment of data adequacy considered information from Reclamation, third-party studies, public and agency comments received during scoping, and appropriate state and federal resource and regulatory agencies. Information was reviewed to determine if it was current. A review for completeness was made, directed toward determining whether sufficient information was available to estimate potential impacts and make appropriate impact comparisons among alternatives. Information was also reviewed for quality, focusing on the data collection methods used, sources of information, and whether the documented results were adequate for preparing a DSEIS.

On the basis of this data adequacy review, probable major issues that would have to be resolved during the preparation of the DSEIS were identified, the adequacy of the existing information to resolve these issues was evaluated, and recommendations for additional data gathering to fill likely data gaps and/or to update information were made.

Additional data were gathered as necessary so that an equal level of analysis could be made for each of the 10 alternatives. Sufficient data were gathered to identify and evaluate potential environmental impacts of each alternative. For example, to evaluate potential construction and operation impacts to the geology of the Aztec Reservoir site (Aztec was identified as one of the off-stream storage options considered as part of Alternative 8), analysts did on-site field work and consulted surface and bedrock maps as well as relevant engineering reports and data. Since there are existing oil and gas wells in the reservoir area, the operating history, cost of acquisition, and requirements of abandonment were assessed, using records from New Mexico state agencies. The geologists coordinated their work with the engineers and hydrologists to develop the size and configuration of a reservoir at this site to meet the M&I water allocations under the Settlement Act of the non-Colorado Ute Indian entities (i.e., the SJWC). The resultant analysis identified structural impediments to constructing a reservoir at Aztec that would have to be overcome. Potential mitigation measures were also identified.

2.3.1.2 Environmental Evaluation Process

The following resource areas were analyzed in terms of potential environmental impacts associated with the development and construction of the structural and non-structural components of each of the alternatives.

- | | |
|-----------------------------|---------------------------------|
| • Agriculture | • Public Services and Utilities |
| • Air Quality | • Recreation |
| • Aquatic (streams) | • Safety |
| • Aquatic (reservoirs) | • Socioeconomics |
| • Archeology | • Threatened/Endangered species |
| • Cultural and Paleontology | • Transportation |
| • Ethnography | • Vegetation (uplands) |
| • Geology and Soils | • Visual/Aesthetics |
| • Hazardous Materials | • Wetlands |
| • Historical resources | • Water Quality |
| • Land Use | • Water Resources/Hydrology |
| • Limnology | • Wildlife |
| • Noise | |

The impacts that were identified in this environmental evaluation process are summarized in the tables presented in Section 2.3.2.

2.3.1.3 Purpose and Need Evaluation

In evaluating whether the ALP Project purpose and need is satisfied by any particular alternative, it is necessary to determine whether it provides a feasible means by which the quantities of water contemplated in the Settlement Agreement can be secured with sufficient certainty. In addition, the

alternative must be reviewed to determine whether it will facilitate overall Settlement implementation. The primary elements necessary to secure an Indian water rights settlement are as follows:

- An agreement by the United States, tribe, state, and a majority of parties to the adjudication, as well as associated legislation, which provides benefits (primarily water rights) to an Indian tribe sufficient to warrant a waiver of the tribe's reserved water rights claims;
- A defined and reasonable time frame by which the tribe will, in fact, secure those benefits specified in the Settlement Agreement;
- Entry of a final decree by the court adjudicating the water rights claims which recognizes the tribe's right to the water and associated benefits identified in the Settlement Agreement; and
- A waiver of the tribe's water rights claims by both the tribe and the United States in its capacity as trustee, becoming effective. The waiver is contingent upon the three previous elements.

Thus, in considering whether a particular alternative meets purpose and need, the following elements must be evaluated in light of the purpose and need factors which were outlined in the NOI published on January 4, 1999. These factors are described as follows:

- **Water Yield.** Will the alternative annually provide the desired volumes of "wet water" (i.e., water readily available for beneficial use) for the Colorado Ute Tribes to satisfy their reserved rights, as well as provide supply to other identified users? The purpose and need statement describes an intent to implement the 1988 Settlement Act that contemplated an average water supply of 62,200 afy (53,200 afy of depletion) being made available to satisfy the Colorado Ute Tribes' water rights claims in the Animas and La Plata River Basins. Supplying this amount of water is the goal by which each alternative is evaluated. It is recognized, however, that the Colorado Ute Tribes may accept less water as part of a modified settlement in return for other benefits received in such a settlement and the continued support of other water users in the local area. Accordingly, there may be some flexibility in the water yield goal as long as the Colorado Ute Tribes have access to some substantial amount of an assured water supply. Nonetheless, given that the Colorado Ute Tribes' flexibility is limited (e.g., Resolution No. 97-160 of the Southern Ute Indian Tribe and Resolution No. 4365 of the Ute Mountain Ute Tribal Council), an assured water supply commensurate with that contemplated in the 1988 Settlement Act is still the standard for analysis.
- **Reliability.** Will the alternative provide a reliable long-term water supply? Will the yield be renewed by the hydrologic cycle? Reliability is a vital part of providing the Colorado Ute Tribes an assured water supply commensurate with the reserved water rights claims they are relinquishing in the Settlement Act.
- **Location.** Will water supplied by the project be reasonably available to the designated users on their lands and/or communities? Are needed water conveyance facilities feasible for development?

- o **Practicability.** Is the development of the alternative technically feasible? Are there impediments or restrictions that make development of the alternative impractical? Some of these perceived impediments may be related to authorization issues or legal processes.

2.3.1.4 Technical and Economic Evaluation

The technical and economic merits of each alternative were evaluated in terms of the following categories:

- Feasibility
- Development costs
- Operation, maintenance, and replacement costs
- Public safety
- Impacts to ongoing operations

These factors were significant in evaluating the overall acceptability of any specific alternative with respect to a modified water rights settlement. In addition, preliminary information on Indian Trust Assets (ITAs) was also evaluated. ITAs include the effects on the Colorado Ute Tribes' land claims, land rights, water rights, cultural resources on trust lands, mineral rights, and hunting and fishing rights.

An engineering analysis and a cost estimate were prepared for the structural and non-structural components of each alternative. The potential impacts from implementation of the non-structural components of alternatives were also analyzed as a means to identify potentially available water. This included an analysis of water conservation on the Pine, Florida, and Dolores Rivers. The analysis also included an evaluation of water rights and a determination of agricultural and land values that would bear on the acquisition of land and water rights to fulfill a portion of the Settlement Act water needs.

2.3.2 Description and Evaluation of Alternatives

This section provides a description of each of the alternatives in terms of its structural and non-structural components. Also included is an estimate of the cost of developing the alternative, a discussion of the potential water supply available, identification of potential impacts to the environment for each alternative, a description of the capability of the alternative to meet the purpose and need requirements, and an analysis of the technical and economic merits of each alternative.

2.3.2.1 Alternative 1 - Administration Proposal

The Administration Proposal includes both a structural and a non-structural component. Elements of each component are designed to achieve the fundamental purpose of securing for the Colorado Ute Tribes an assured water supply in satisfaction of their water rights as determined by the 1986 Settlement Agreement and the 1988 Settlement Act. The ALP Project would provide for the identified, M&I water needs as discussed under Section 2.1.1 of this DSEIS.

2.3.2.1.1 Structural Component

The structural component of Alternative 1 includes an off-stream storage reservoir with a capacity of approximately 90,000 af, no inactive storage, and only a limited amount of "dead" storage; a pumping plant with up to approximately 240 cfs of capacity; and a reservoir inlet conduit, all designed to deplete

no more than an average of 57,100 afy. This depletion limit is consistent with the 1996 Biological Opinion issued by the Service. The proposed reservoir would be located at the Ridges Basin site.

Uses of water from the ALP Project would be limited to primarily M&I use only (i.e., no irrigation uses are authorized) and would be allocated in the manner shown in **Table 2-6**.

<p style="text-align: center;">Table 2-6 Alternative 1 Allocation of ALP Project Water for M&I Purposes</p>	
Entity	Depletion Allowance (afy)
Southern Ute Indian Tribe	19,980
Ute Mountain Ute Tribe	19,980
Navajo Nation	2,340
Animas-La Plata Water Conservancy District	2,600
San Juan Water Commission	10,400
Subtotal	55,300
Allowance for Reservoir Evaporation	1,800
Total Depletion	57,100

2.3.2.1.2 Non-Structural Component

Alternative 1 includes a non-structural element that would establish and utilize a water acquisition fund which the Colorado Ute Tribes could use over time to acquire water rights on a willing buyer/willing seller basis. For the purpose of analyzing the impacts associated with the purchase of water rights, it was estimated that approximately 13,000 afy of historical depletions would be available from the purchase of presently irrigated land in the project area. This is in addition to the 39,960 af of new depletions available for M&I use by the Colorado Ute Tribes from Ridges Basin Reservoir. Previous estimates indicated that a fund of approximately \$40 million would be sufficient to purchase the additional water rights, should the Tribes so desire. The Administration Proposal also allows some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities. In this sense, the water acquisition fund does not guarantee the acquisition of additional water by the Colorado Ute Tribes. That decision, however, will be the Tribes to make.

Overview of Approach to Purchase Land and Water Rights

The acquisition of land and associated water rights to provide water supplies for the future potential water uses identified in Section 2.1.1 was evaluated. As noted previously in this chapter, these water uses are non-binding, but the projected uses are considered reasonable for purposes of evaluating the range of potential impacts.

The acquisition of water rights was evaluated using basin-wide depletion factors for estimating the general location and quantity of irrigated lands and water rights to be potentially acquired. Actual acquisition of the water rights would require a case-by-case analysis to identify specific water rights to be purchased and the required implementation program for delivering water to the end uses. This would include (1) acquiring water rights through the purchase of existing irrigated lands, (2) leaving the water

on the land or transferring through the water court system the use of those water rights to a new type and place of use, (3) securing the use of existing reservoirs or constructing new reservoirs to regulate and reshape the water deliveries to a M&I demand pattern, and (4) constructing conveyance facilities to deliver the water to the end use. The main steps included in this evaluation are listed below:

1. Formulate water use needs.
2. Establish criteria and assumptions for identifying potential lands and water rights for acquisition (i.e., location of lands, priority date of water rights).
3. Obtain existing information concerning water rights, including, but not limited to, decrees, compacts, agreements, diversion records, streamflow records, cropping and irrigation practices, soils information, land use maps, and previous water resource studies.
4. Aggregate water uses for the various alternatives by river basin and user.
5. Estimate basin-wide historical firm (dry year) depletion factor for irrigation.
6. Estimate total irrigated acreage required to be purchased in each basin for the various M&I uses.
7. Compare required acreage to be purchased from existing non-Indian irrigated lands in each basin.
8. Estimate amount of storage that would be required in each basin to regulate deliveries on a firm M&I demand pattern.
9. Identify conveyance facilities that would be required in each basin to deliver the water to the end uses.
10. Identify and describe key legal and institutional considerations involved in a water rights acquisition and implementation program.

Preliminary depletion values were developed for each major subbasin within the San Juan River Basin. (Note: The term *depletion* relates to the water that is actually consumed or water that, once diverted, does not appear as return flow.) The depletion values were used to address the issue of quantifying the land purchase requirements to meet the 13,000 afy of additional depletion required to fulfill the 1986 Settlement Agreement. These values represent average depletion values and account for varying climate, changes in cropping patterns, and availability of divertible water. The basin-wide firm, dry year (i.e., years having relatively low annual precipitation amounts) depletion factors for basins within Colorado were estimated based upon preliminary results from the San Juan Operation Model (Bliesner 1999), basin-wide water studies published by the Colorado Water Resources Division 7 Engineer (Colorado Division of Water Resources 1983 through 1998), previous model results provided by Reclamation, and the consumptive irrigation requirements reported by the Soil Conservation Service, now known as the Natural Resource Conservation Service (1988). The depletion factors for basins within New Mexico were provided during an interview with representatives of the State Engineers Office (Enenbach and Oxford 1999) as factors typically used in water transfer proceedings within the San Juan River Basin. The basin-wide firm, dry year depletion factors used for this evaluation are listed in **Table 2-7**.

Table 2-7 Basin-Wide Firm (Dry Year) Depletion Factors	
State of Colorado	Depletion Factor (af per acre per year)
Pine River	1.4
Animas and Florida Rivers	1.4
La Plata River	0.9
Mancos River	1.3
McElmo Creek	1.6
State of New Mexico	
Animas and San Juan Rivers	1.64

Existing Non-Indian Irrigated Lands Potentially Available for Acquisition

For the purposes of completing this analysis, the irrigated lands potentially available for acquisition would be the existing non-Indian irrigated lands within each basin. It should be noted that these are the total lands potentially available and do not reflect current listings or future willing sellers.

Estimates of the existing non-Indian irrigated lands within each basin for Colorado and New Mexico have been developed based on available information. The estimates of existing irrigated lands potentially available for acquisition are shown in **Table 2-8**. See **Map 2-3** for the location of these lands.

Table 2-8 Lands Potentially Available for Purchase	
Location	Existing Non-Indian Irrigated Acreage (acres)
State of Colorado	
Pine River	30,000
Animas/Florida Rivers	35,000
La Plata River	15,000 - 21,000 ^a
Mancos River	12,000
McElmo Creek	43,000
State of New Mexico	
Animas/San Juan Rivers	20,000
^a The existing non-Indian irrigated acreage is reported as a range for the La Plata River due to unresolved discrepancies in available information	

The following assumptions and guidelines were adopted for use in evaluating potential water rights acquisition under this alternative:

1. The evaluation would be conducted assuming the full 13,000 afy depletion would be acquired. The amount was split evenly between each Tribe as a guide in identifying potential water rights to meet uses for each Tribe.
2. The use of water under this acquisition fund is not restricted to M&I uses but rather could be used for all uses including M&I and irrigation.

3. The possible uses identified are non-binding and represent reasonable estimates for purposes of evaluating potential impacts.
4. For the 6,500 afy of depletion for the Ute Mountain Ute Tribe, the non-binding uses of the acquired water rights would be as follows:
 - (a) 4,000 afy of depletions (8,000 afy of diversions) that would flow downstream in the Mancos River before being diverted for M&I use.
 - (b) 2,500 afy of depletions (5,000 afy of diversions) associated with acquisition of existing ranching operations for continued irrigation uses in the vicinity of existing Ute Mountain Ute Tribe s ranch land in the La Plata River Basin.
5. For the 6,500 afy of depletion for the Southern Ute Indian Tribes, the possible non-binding uses of the acquired water rights would be as follows:
 - (a) 3,250 afy of depletions (6,500 afy of diversions) that would flow downstream in the Pine River before being diverted for M&I use.
 - (b) 3,250 afy of depletions (6,500 afy of diversions) associated with acquisition of existing irrigated lands for continued irrigation uses in the vicinity of existing Southern Ute Indian Tribal land in the Florida and Pine River Basins.

The existing non-Indian irrigated acreage within each basin has been compared to the estimated land to be acquired. The results of this comparison are shown in **Table 2-9**. Constraints to the purchase of water rights are described in Attachment D.

Table 2-9 Summary of Estimated Irrigated Acreage to be Acquired for Water Rights Acquisition Program to Satisfy 13,000 afy Depletion Non-Structural Component			
Basin	Existing Non-Indian Irrigated Acreage (acres)	Acreage Acquired (acres)	Percentage of Acreage Required (%)
Colorado			
Pine River	30,000	2,300	7.7
Animas/Florida Rivers	35,000	2,300	6.6
La Plata River	21,000	2,400	11.4
Mancos River	12,000	3,300	27.5
McElmo Creek	43,000	0	0.0
New Mexico			
Animas/La Plata Rivers	20,000	0	0
Total	161,000	10,300	6.4

Map 2-3 Location of Irrigated Agricultural Lands Within the ALP Project Area

[back page of Map 2-3]

2.3.2.1.3 *Environmental Impacts Associated with Alternative 1*

Table 2-10 provides a summary of the environmental impacts associated with Alternative 1.

Table 2-10 Alternative 1 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	Pumping capacity of 240 cfs could have a negative impact on the trout and native fish in the Animas River depending on the timing of pumping and magnitude of pumping. No conservation pool (carryover storage) would be provided in Ridges Basin Reservoir for a carryover fishery. During the drier hydrologic periods, all storage in the reservoir would be depleted, leaving no water in the reservoir for a fishery.
Cultural	Archaeological surveys conducted within Ridges Basin and the other features composing Alternative 1 indicated that there could be substantial impacts to cultural resources from construction of this alternative. Data indicates that approximately 60 cultural resource sites are located within the defined features of Alternative 1 and that those resources could be negatively affected by construction. With the various utility relocations, including the Northwest Pipeline, and other related project features, approximately 380 cultural resource sites could be affected by construction of this alternative.
Hydrology	This alternative would negatively impact flow regime in the Animas and San Juan Rivers.
Recreation	There is potential for slight negative impacts to rafting and fishing in the Animas River. There would be a positive impact to increase boating opportunities and the potential for a recreational campground in Ridges Basin.
Socioeconomics (Structural)	The construction of Ridges Basin Reservoir and Dam would have a positive impact on the local economy.
Socioeconomics (Non-Structural)	Impacts could be negative if the Colorado Ute Tribes were to purchase approximately 6 percent of the irrigated lands in Pine, Florida, La Plata, Mancos Rivers, and McElmo Creek Basins, thereby displacing non-Indian farmers. If the land is transferred into trust land, there would be a negative impact to the local tax base. If the Colorado Ute Tribes used the \$40 million for water-related economic development activities, it would have a positive impact on the economy.
Threatened/Endangered Species	This alternative would not meet the endangered species flow requirements or flow recommendations from the SJR BRIP.
Water Quality	The net result of pumping 95,000 af into Ridges Basin Reservoir would be that the water quality would degrade on the Animas River with a 2 to 4 percent increase in total dissolved solid concentration in the Animas River on an average yearly basis, depending on the location.
Wetlands	There would be a loss of 121 acres of wetlands in Ridges Basin Reservoir. Approximately 13 acres of wetlands below Ridges Basin Dam would be impacted. Also, there would be wetland/riparian vegetation composition (reduced cottonwood recruitment) changes due to dewatering or habitat conversion between Flora Vista and San Juan River confluence. With respect to the non-structural portion of the alternative, any water that is purchased and moved off the land and converted to another purpose could also impact wetlands.
Wildlife/Vegetation	Ridges Basin Reservoir would inundate approximately 1,280 acres of wildlife habitat.

2.3.2.1.4 *Evaluation of the Capability of Alternative 1 to Meet Purpose and Need Requirements of the Project*

Table 2-11 summarizes the evaluation of the capability of Alternative 1 to meet the purpose and need.

Table 2-11 Alternative 1 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	The alternative would provide the required water yield to satisfy 57,100 afy depletion for the structural component and establish a water acquisition fund that could be used to acquire potentially 13,000 afy depletion on a willing buyer/willing seller basis for non-structural component.
Reliability	The alternative would provide the required water yield on a long-term annual basis.
Location	The alternative would provide "wet water" in a reasonable location for potential users. In some cases of Colorado Ute Tribe uses, the Ridges Basin Reservoir is located at a much further distance than is desired, but flexibility exists with water acquisition. The alternative would receive a moderate ranking for location.
Practicability	The development of the alternative is technically feasible. Substantial investigations have been conducted at the Ridges Basin Dam site to verify that a safe dam can be constructed. There is an impediment from an endangered species standpoint. The pumping schedule proposed for this alternative could prevent the flow recommendations from being met on the San Juan River during project operation. This would result in a very low ranking as far as practicability is concerned for Alternative 1 and would fail the test of practicability.
^a 13,240 afy depletion is needed to fully fulfill the 1986 Settlement Agreement depletion amount of 53,200 afy.	

2.3.2.1.5 *Evaluation of the Technical and Economic Merits of Alternative 1*

Table 2-12 summarizes the evaluation of technical and economic factors of Alternative 1.

Table 2-12 Alternative 1 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	This alternative would satisfy Colorado Ute Tribes ITAs by satisfying the water rights claims of the Colorado Ute Tribes as quantified in the Settlement Act. Development of the project would impact the Jicarilla Apache Tribe and the Navajo Nation in that it would be more difficult to develop more water from the San Juan River.
Feasibility	The development of the alternative is technically feasible. Substantial investigations have been conducted at the Ridges Basin Dam site to verify that a safe dam can be constructed. The feasibility of purchasing land to satisfy the approximately 13,000 afy for the non-structural component could prove to be difficult, but the Colorado Ute Tribes have the option of using the \$40 million water acquisition fund for economic development.
Development Costs	The cost for the structural component of Alternative 1 is estimated at \$163 million. The cost for the non-structural component of purchasing land and associated water rights to satisfy 13,000 afy of depletion is estimated at \$54 million. This represents a total estimated cost of \$217 million for Alternative 1. (Note: the \$54 million is larger than what is presently proposed for the water acquisition fund (\$40 million) for Alternative 1.)
Operation, Maintenance, and Replacement Costs	The annual operating cost would be approximately \$1.6 million.
Public Safety	A safe dam could be constructed at Ridges Basin. There are no active hazardous waste sites in the project area.
Impacts to Ongoing Operations	There would be no impacts to ongoing operations.

2.3.2.2 Alternative 2 - Administration Proposal with Recreation Element Added

2.3.2.2.1 Structural Component

This component would be the same as described under Alternative 1, Section 2.3.2.1.1, with the exception that the reservoir would be enlarged by 30,000 af (conservation pool) for recreation and water quality purposes, thereby increasing the overall reservoir size of Ridges Basin to approximately 120,000 af.

2.3.2.2.2 Non-Structural Component

Same as described under Alternative 1, Section 2.3.2.1.2.

2.3.2.2.3 Environmental Impacts Associated with Alternative 2

Table 2-13 provides a summary of the environmental impacts associated with Alternative 2.

Table 2-13 Alternative 2 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	Impacts to the Animas River would be the same as Alternative 1. A conservation pool (carryover storage of approximately 30,000 af) would be provided in Ridges Basin Reservoir for establishing a fishery.
Cultural	This alternative includes 70 cultural resource sites in the currently defined project area. Construction of this alternative could impact approximately 380 cultural resource sites.
Hydrology	Same as described under Alternative 1.
Recreation	Same as described under Alternative 1.
Socioeconomics (Structural)	Same as described under Alternative 1.
Socioeconomics (Non-Structural)	Same as described under Alternative 1.
Threatened/Endangered Species	This alternative would not meet endangered fish flow requirements in the San Juan River and would have an impact on the endangered fish in that designated critical habitat.
Water Quality	Impacts to the Animas River would be essentially the same as Alternative 1. The establishment of a conservation pool would allow better water quality to be maintained in Ridges Basin Reservoir.
Wetlands	Same as described under Alternative 1
Wildlife/Vegetation	The reservoir size would be slightly larger than Alternative 1 and would result in a slight increase in loss of habitat (1,490 acres) for wildlife.

2.3.2.2.4 *Evaluation of the Capability of Alternative 2 to Meet Purpose and Need Requirements of the Project*

Table 2-14 summarizes the evaluation of the capability of Alternative 2 to meet the purpose and need.

Table 2-14 Alternative 2 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Same as described under Alternative 1.
Reliability	Same as described under Alternative 1.
Location	Same as described under Alternative 1.
Practicability	Same as described under Alternative 1.

2.3.2.2.5 *Evaluation of the Technical and Economic Merits of Alternative 2*

Table 2-15 summarizes the evaluation of technical and economic factors of Alternative 2.

Table 2-15 Alternative 2 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under Alternative 1.
Feasibility	Same as described under Alternative 1.
Development Costs	The cost for the structural component of Alternative 2 is estimated at \$185 million. The cost for the non-structural component of purchasing land and associated water rights to satisfy 13,000 af of depletion is estimated at \$54 million. This represents a total estimated cost of \$239 million for Alternative 2. First-time filling of the reservoir would require that an additional 30,000 af be pumped into the reservoir to fill the conservation pool that would be established. Also, each year approximately 400 af of additional water would need to be pumped to the reservoir to make up for the additional evaporation due to the larger reservoir (90,000 af as compared to 120,000 af).
Operation, Maintenance, and Replacement Costs	Same as described under Alternative 1.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.3 **Alternative 3 - Administration Proposal with San Juan River Basin Recovery Implementation Program Element Added**

2.3.2.3.1 **Structural Component**

This alternative would satisfy the same purpose and need and entail the same facilities as Alternative 1, as described in Section 2.3.2.1.1. The reservoir size of Ridges Basin would be approximately 105,000 af. Pumping to Ridges Basin would be reduced during the spring runoff period of selected years. This would provide an advantage over Alternative 1 and Alternative 2 in that the additional storage of 15,000 af, combined with reduced pumping during spring runoff, would not affect the ALP Project's ability to meet the flow recommendations on the San Juan River.

2.3.2.3.2 **Non-Structural Component**

Same as described under Alternative 1, Section 2.3.2.1.2.

2.3.2.3.3 **Environmental Impacts Associated with Alternative 3**

Table 2-16 provides a summary of the environmental impacts associated with Alternative 3.

<p style="text-align: center;">Table 2-16 Alternative 3 Impacts to Environmental Resource Areas</p>	
Resource Area	Description of Impacts
Aquatic	Same impact as Alternative 1, except that an additional activity capacity of approximately 15,000 af would be added to Ridges Basin Reservoir and pumping would be regulated (lowered) during the spring runoff period of selected years to help achieve flow recommendations for the San Juan River. No conservation pool (carryover storage) would be provided in Ridges Basin Reservoir for a carryover fishery. During the drier hydrologic periods, all storage in the reservoir would be depleted leaving no water in the reservoir for a fishery. It would be a simply put-and-take fishery.
Cultural	Same as described under Alternative 1.
Hydrology	Same as described under Alternative 1.
Recreation	Same as described under Alternative 1.
Socioeconomics (construction)	Same as described under Alternative 1.
Socioeconomics (Non-Structural)	Same as described under Alternative 1.
Threatened/Endangered Species	This alternative minimizes the negative effect on endangered fish species in the San Juan River. Pumping would be set so that flow recommendations in the San Juan River are met and it would be a benefit to the endangered fish in the river.
Water Quality	Similar impact as described under Alternative 1.
Wetlands	Similar impact as described under Alternative 1.
Wildlife/Vegetation	The reservoir size would be slightly larger than Alternative 1 and would result in slightly more loss of habitat for wildlife (approximately 1,370 acres).

2.3.2.3.4 *Evaluation of the Capability of Alternative 3 to Meet Purpose and Need Requirements of the Project*

Table 2-17 summarizes the evaluation of the capability of Alternative 3 to meet the purpose and need.

Table 2-17 Alternative 3 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Same as described under Alternative 1.
Reliability	Same as described under Alternative 1.
Location	Same as described under Alternative 1.
Practicability	The development of the alternative is technically feasible. Substantial investigations have been conducted at the Ridges Basin Dam site to verify that a safe dam can be constructed. This alternative would also not affect meeting the flow recommendations for the endangered fish in the San Juan River. Therefore this alternative would receive a high ranking for practicability.

2.3.2.3.5 *Evaluation of the Technical and Economic Merits of Alternative 3*

Table 2-18 summarizes the evaluation of technical and economic factors of Alternative 3.

Table 2-18 Alternative 3 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under Alternative 1. Decreasing the pumping rates during certain spring runoff periods could lessen the impact of additional water development on the endangered fish in the San Juan River Basin and lessen the impact to Jicarilla Apache and Navajo Nation water development.
Feasibility	Same as described under Alternative 1.
Development Costs	The cost for the structural component of Alternative 3 is estimated at \$170 million. The cost for the non-structural component of purchasing land and associated water rights to satisfy 13,000 ac of depletion is estimated at \$54 million. This represents a total estimated cost of \$224 million for Alternative 3 (Note: the \$54 million is larger than the \$40 million presently proposed for the water acquisition fund).
Operation, Maintenance, and Replacement Costs	Same as described under Alternative 1.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.4 Alternative 4 - Administration Proposal with San Juan River Basin Recovery Implementation Program and Recreation Element Added

2.3.2.4.1 Structural Component

This alternative would satisfy the same purpose and need and entail the same facilities as described in Alternative 1, Section 2.3.2.1.1. A conservation pool of approximately 30,000 af to serve recreation and water quality purposes would be added to the reservoir size. Pumping to Ridges Basin would be regulated during the spring runoff period of selected years to help achieve flows in the San Juan River as specified in the flow recommendations for the SJRBRIP. To compensate for the time of reduced pumping during spring runoff periods, the reservoir size would be increased by an additional 15,000 af requiring a total reservoir capacity at Ridges Basin of approximately 135,000 af. Of this amount, 105,000 af would be designated as active capacity and 30,000 af as inactive capacity.

2.3.2.4.2 Non-Structural Component

Same as described under Alternative 1, Section 2.3.2.1.2.

2.3.2.4.3 Environmental Impacts Associated with Alternative 4

Table 2-19 provides a summary of the environmental impacts associated with Alternative 4.

<p style="text-align: center;">Table 2-19 Alternative 4 Impacts to Environmental Resource Areas</p>	
Resource Area	Description of Impacts
Aquatic	Same impact to the Animas River as described under Alternative 3. There is additional storage for a recreational pool in Ridges Basin Reservoir and it is likely that this alternative would allow a recreational fishery with a year-round carryover of stocked trout in the reservoir.
Cultural	It estimated that there are 80 to 90 cultural resource sites located within the boundaries of this alternative. However, as with Alternatives 1, 2, and 3, the additional utility relocation and other elements would bring the number of affected cultural resource sites up to the estimated 430 sites.
Hydrology	Same impact as described under Alternative 1.
Recreation	Same as described under Alternative 2. There would also be increased opportunities for a recreational fishery in the reservoir.
Socioeconomics (Construction)	Same as described under Alternative 1.
Socioeconomics (Non-Structural)	Same as described under Alternative 1.
Threatened/Endangered Species	This alternative would have a positive benefit to endangered fish in the San Juan River.
Water Quality	Same as described under Alternative 2.
Wetlands	Same as described under Alternative 1.
Wildlife/Vegetation	Under this alternative, the reservoir size at Ridges Basin would be 135,000 af versus the 90,000 af size in Alternative 1 and would result in the loss of approximately 1,570 acres of wildlife habitat.

2.3.2.4.4 *Evaluation of the Capability of Alternative 4 to Meet Purpose and Need Requirements of the Project*

Table 2-20 summarizes the evaluation of the capability of Alternative 4 to meet the purpose and need.

Table 2-20 Alternative 4 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Same as described under Alternative 1.
Reliability	Same as described under Alternative 1.
Location	Same as described under Alternative 1.
Practicability	Same as described under Alternative 3.

2.3.2.4.5 *Evaluation of the Technical and Economic Merits of Alternative 4*

Table 2-21 summarizes the evaluation of technical and economic factors of Alternative 4.

Table 2-21 Alternative 4 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under Alternative 3.
Feasibility	Same as described under Alternative 1.
Development Costs	The cost for the structural component of Alternative 4 is estimated at \$193 million. The cost for the non-structural component of purchasing land and associated water rights to satisfy 13,000 afy of depletion is estimated at \$54 million. This represents a total estimated cost of \$247 million for Alternative 4. (Note: The \$54 million is larger than the \$40 million presently proposed for the water acquisition fund).
Operation, Maintenance, and Replacement Costs	Same as described under Alternative 2.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.5 Alternative 5 - Animas-La Plata Reconciliation Plan

2.3.2.5.1 Structural Component

This alternative represents the structural alternative developed during the Romer-Schoettler process. Under this plan, the ALP Project would be modified. The revised project would include a reservoir at Ridges Basin with a storage capacity of 260,000 af feet and a Durango Pumping Plant of approximately 240 cfs at the current location. The project sponsors have agreed to allocate the 57,100 afy average depletions as shown in **Table 2-22**.

This plan guarantees that two-thirds of the water would be allocated exclusively to the Colorado Ute Tribes. Four communities in southwestern Colorado and northwestern New Mexico would use the balance.

Table 2-22 Alternative 5 Allocation of ALP Project Water	
Entity	Depletion (afy)
Southern Ute Indian Tribe	16,525
Ute Mountain Ute Tribe	16,525
San Juan Water Commission	10,400
Navajo Nation	2,340
Animas-La Plata Water Conservancy District	2,600
Colorado Non-Indian Irrigation	5,230
New Mexico Non-Indian Irrigation	780
Allowance for Reservoir Evaporation	2,700
Total	57,100

The plan would be contingent upon transfer of ownership of the diversion right of New Mexico Permit No. 2883 to the SJWC in accordance with New Mexico law. The permit (water rights for the ALP Project in New Mexico) is now held by the United States through Interior and Reclamation. The SJWC would hold its portion of the permit and the water rights in conformity with applicable law and for the purposes of the revised project. The parties contemplate that the transfer of ownership would be accomplished through an agreement between the SJWC and Interior.

2.3.2.5.2 Non-Structural Component

There is no non-structural component to Alternative 5.

2.3.2.5.3 *Environmental Impacts Associated with Alternative 5*

Table 2-23 provides a summary of the environmental impacts associated with Alternative 5.

Table 2-23 Alternative 5 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	The pumping rate that would occur at the Durango Pumping Plant would not impact the trout or native fish in the Animas River. The Ridges Basin Reservoir would be large enough to sustain a trout fishery that would carryover from year to year.
Cultural	Numerous cultural resource sites (estimated at between 90 and 100) could be negatively affected by construction of the features of this alternative. With the estimate of the cultural resources within Ridges Basin and associated project features, the number of sites is estimated to be nearly 200.
Hydrology	This reservoir size would have a positive effect on water resources and would give flexibility to the project.
Recreation	There is the potential for slight negative impacts to rafting and fishing on the Animas River and a positive impact to increase boating opportunities on Ridges Basin Reservoir and to provide the potential for a recreational campground. Also, there would be increased opportunities for a recreational fishery in the reservoir.
Socioeconomics (Structural)	Because of the larger dam and resulting costs, the impacts to the local economy would be positive and slightly larger than those for Alternative 1.
Socioeconomics (Non-Structural)	There is not a non-structural component to Alternative 5 and, therefore, there are no impacts.
Threatened/Endangered Species	Ridges Basin Reservoir has sufficient capacity to allow a pumping rate from the Animas River that would not affect the ability to meet the flow recommendations for the endangered fish in the San Juan River.
Water Quality	Essentially the same as described under Alternative 2. A larger inactive storage pool in Ridges Basin Reservoir would help maintain better water quality. Water quality could be impacted in the La Plata and San Juan Rivers if the proposed irrigation took place.
Wetlands	Same as described under Alternative 1.
Wildlife/Vegetation	Under this alternative the reservoir capacity of Ridges Basin would be 260,000 af versus the 90,000 af size in Alternative 1. This would result in a loss of approximately 2,190 acres of wildlife habitat.

2.3.2.5.4 *Evaluation of the Capability of Alternative 5 to Meet Purpose and Need Requirements of the Project*

Table 2-24 summarizes the evaluation of the capability of Alternative 5 to meet the purpose and need.

Table 2-24 Alternative 5 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Would not supply all of the water to satisfy 62,200 afy diversions (or 53,200 afy of depletions) to Colorado Ute Tribes. Therefore, Alternative 5 does not pass the water yield test.
Reliability	The alternative would provide the required water yield as specified in the alternative plan, however, it only supplies enough water to partially satisfy the claims of the Colorado Ute Tribes. Therefore, Alternative 5 only partially passes the test of reliability in providing a renewable water supply.
Location	The alternative would provide "wet water" in a reasonable location for potential users. In some cases of Colorado Ute Tribe uses, the Ridges Basin Reservoir is located at a much further distance than is desired. The alternative would receive a moderate ranking for location.
Practicability	It is practicable to construct a dam at Ridges Basin. The plan could be implemented but it would not be readily acceptable because it would not satisfy the water rights under the Settlement Act.

2.3.2.5.5 *Evaluation of the Technical and Economic Merits of Alternative 5*

Table 2-25 summarizes the evaluation of technical and economic factors of Alternative 5.

Table 2-25 Alternative 5 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Colorado Ute Tribes agreed to settle for the water provided in Alternative 5. The flexibility of the large Ridges Basin Reservoir could aid in meeting the flow recommendations for the endangered fish in the San Juan River, and thereby aiding in the development of water resources of the Jicarilla Apache Tribe and the Navajo Nation.
Feasibility	Constructing a dam at Ridges Basin is feasible but the overall plan would not be acceptable in terms of satisfying the water rights of the Colorado Ute Tribes and, therefore, fails the test of feasibility.
Development Costs	This alternative is projected to cost \$290 million. State and local cost sharing would equal \$33 million of the \$290 million.
Operation, Maintenance, and Replacement Costs	Same as described under Alternative 1.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.6 Alternative 6 - Animas River Citizen's Coalition Conceptual Alternative

2.3.2.6.1 Structural Component

Alternative 6 is primarily a non-structural alternative, but consideration is given to the use of existing facilities and/or their structural modification such as raising dams for additional storage.

2.3.2.6.2 Non-Structural Component

Alternative 6 represents the non-structural proposal developed during the Romer-Schoettler process. This conceptual plan would supply 62,200 afy (52,300 afy depletion) of water to the Colorado Ute Tribes to meet the requirements of the Settlement Agreement and the Settlement Act. The plan consists of two primary elements: (1) creation of a fund for the purchase of water rights and lands within the vicinity of the two Colorado Ute Tribes, and (2) the use or purchase of water available now and in the future from existing projects or through expansion of selected existing projects and/or delivery systems. The two elements would be used in combination, through the free market system, to provide the necessary water. Although not a part of this proposed project, the plan also suggests ways to provide water to the Navajo Nation, Colorado, and New Mexico municipalities. The two primary elements of this proposal are further described below:

Fund for Land and Water Acquisition

This element envisions the creation of a dedicated fund for acquisition by the Colorado Ute Tribes, at their sole discretion, of water rights and land from willing sellers within and in the vicinity of the Southern Ute Indian and Ute Mountain Ute Reservations. Purchases could be spread over a 30-year period to allow willing sellers to be identified and minimize any disruption of local markets. The fund would be created by the federal government and the State of Colorado, in appropriate shares, from future legislative appropriations and funds presently earmarked for the proposed ALP Project.

The acquisition of water and land purchases is the foundation of this proposal. The amount of land required to be purchased would depend upon: (1) if the water and land use remain unchanged and/or; (2) if the water was moved from the land and used for some other purpose. Less land would be required to be purchased if the land and water use remained unchanged. For example, if all the water and land use were to remain unchanged, then the amount of historical depletions would be the measure that would be used to calculate the amount of land and water that would be required.

The allowable depletions and diversions specified under the 1986 Settlement Agreement are summarized in **Table 2-26**.

Table 2-26 Allowable Depletions and Diversions Specified Under the 1986 Settlement Agreement		
Ute Tribe	Depletions (afy)	Diversions (afy)
Ute Mountain Ute	26,600	32,300
Southern Ute Indian	26,600	29,900
Total	53,200	62,200

The depletions shown in Table 2-26 correspond to the historical consumptive use (or depletions) of existing irrigation rights. The historical depletion is the measure of the water right in terms of the amount of water that can be consumed under a transfer to a new use without causing injury to other water rights. Once the historical depletion of a particular right is determined, the amount of land needed to be acquired can be calculated. Table 2-7, shown previously under Alternative 1, Section 2.3.2.1.2, displays the depletion of factors for the various river basins. It should be noted that in addition to maintaining historical depletions, the transfer must replicate historical return flows to avoid injury to other water rights. Other conditions must also be satisfied to obtain approval of a transfer in accordance with the statutes and case law of the States of Colorado and New Mexico.

The description of the Animas River Citizen's Coalition Conceptual Alternative (1997) (now Alternative 6 in this DSEIS) does not provide details concerning the proposed use of the water by the Colorado Ute Tribes. However, the description does include a discussion of the desire to obtain land and water rights within or near the existing reservations. For the purposes of this analysis, it is assumed that presently irrigated lands (and the associated water rights) would be obtained within or near the existing reservations and the non-binding end use of the water by the Colorado Ute Tribes could include a range of uses. The two water use scenarios developed for evaluating the range of potential impacts of the proposed water rights acquisition program for Alternative 6 are described below. The non-binding M&I uses are the same as the projected possible uses identified for the Colorado Ute Tribes and other ALP Project beneficiaries for M&I purposes as identified in Table 2-2.

o Water Use Scenario 1 (Leave water on land for agricultural use) (Alternative 6a)

The first scenario has been developed based on the description provided in the Animas River Citizen's Coalition Conceptual Alternative (1997). This scenario involves the acquisition of land and water rights within or near the Ute Mountain Ute and Southern Ute Indian Reservations in sufficient quantity to generate the amount of firm depletions specified in the 1986 Settlement Agreement. No specific end uses are identified for Scenario 1, but the amount of land estimated for acquisition would allow continued use for irrigation.

o Water Use Scenario 2 (Transfer to M&I use points) (Alternative 6b)

The second scenario builds on the first scenario and also involves acquisition of land and water rights sufficient to generate the firm depletions specified in the Settlement Agreement. However, the non-binding end uses of the water would be similar to the projected possible uses identified for the Colorado Ute Tribes and other project beneficiaries for M&I purposes as described in Section 2.1.1. Potential impacts associated with any required conveyance facilities and other measures associated with changing the use of the water for different Tribal uses may require subsequent NEPA review.

The following assumptions and guidelines were adopted for use in evaluating potential land and water rights acquisition under this alternative:

1. The projected possible M&I use identified in Section 2.1.1 can be assigned by Tribe and water basin.
2. The possible uses identified for this exercise are non-binding and represent reasonable estimates for purposes of evaluating potential impacts.

3. For the purposes of the analysis, the allowable depletions under the 1986 Settlement Agreement in excess of the projected possible M&I uses would be available for regional water supplies as described by Riley (1999a).
4. The projected possible M&I uses are to be provided on a firm (dry year) basis under typical M&I demand patterns.
5. The projected possible M&I uses are to be met by water rights acquisitions within the basin where the use will occur.
6. Basin-wide, firm (dry year) depletion factors are used in this analysis for estimating the amount of land to be acquired. It is recognized that implementation of an acquisition program would require evaluation of specific depletion factors and other considerations on a right-by-right basis.
7. Firm (dry year) depletion factors are used for determining the amount of land to be acquired. This will tend to minimize the volume of the required storage reservoirs that are necessary to reshape the historical diversions and depletions of water rights used under an irrigation season demand pattern when converted to M&I purposes on a year-round demand schedule.
8. The projected land acquisitions for Water Use Scenario 1 are distributed within the river basins adjoining existing reservation lands.
9.
 - (a) For Water Use Scenario 2, the projected possible M&I uses have been aggregated by river basin and are summarized in the top portion of **Table 2-27**. The M&I use for the gas-fired power plant to be located on Ute Mountain Ute lands in New Mexico has been assigned to the Animas River Basin due to: (1) the La Plata River Basin is water-short and (2) water acquired in the La Plata River Basin within Colorado likely could not be delivered to the proposed point of diversion on the San Juan River in New Mexico because of difficulty of delivering this water down the La Plata River to the desired location.
 - (b) The remaining allowable depletions and diversions under the 1986 Settlement Agreement would be available to meet regional water supplies (see bottom portion of Table 2-27). The remaining allowable depletions are 30,660 afy (53,200 - 22,540). The remaining depletions (and diversions) have generally been distributed in accordance with the regional demand centers identified by Riley (1999a).

The total projected uses for Water Use Scenario 2 are listed in Table 2-27.

It should be noted that the above depletions correspond to the depletions specified in the 1986 Settlement Agreement but the diversions differ by approximately two percent. The difference is small and is due to differing water uses between the Settlement Agreement and the uses adopted for this analysis. The key parameter for this analysis is the depletions, which are identical.

Table 2-27 Water Use Scenario 2 Projected M&I Uses by River Basins						
M&I Uses by Colorado Ute Tribes Only						
River Basin	Ute Mountain Ute		Southern Ute Indian		Total	
	Depletion	Diversion	Depletion	Diversion	Depletion	Diversion
Pine	0	0	0	0	0	0
Florida	0	0	120	140	120	140
Animas	2,300	2,300	785	800	3,085	3,100
La Plata	770	895	14,055	14,055	14,805	14,950
Mancos	4,530	8,610	0	0	4,530	8,610
Total	7,600	11,805	14,940	14,995	22,540	26,800
Total M&I Uses Including On-Reservation Uses and Regional M&I Supply Leased by Colorado Ute Tribes						
River Basin	Ute Mountain Ute		Southern Ute Indian		Total	
	Depletion	Diversion	Depletion	Diversion	Depletion	Diversion
Pine	2,930	3,387	11,660	13,480	14,590	16,460
Florida	8,745	10,110	120	140	8,865	10,250
Animas	8,745	10,110	785	800	9,530	10,910
La Plata	1,650	1,915	14,035	14,055	15,685	15,970
Mancos	4,530	8,610	0	0	4,530	8,610
Total	26,600	34,132	26,600	28,475	53,200	62,200

The existing non-Indian irrigated acreage within each basin has been compared to the estimated land to be acquired for each alternative. It should be noted that previous computations contained in a report by the Animas River Citizens Coalition Conceptual Alternative (August 1997) stated that a value of 2.5 af per acre would be available for transfer. Colorado water law, like other states, only allows the transfer of the depletion of the water resulting from the use. What this means is that considerably more acreage will need to be purchased than previously calculated to satisfy the Colorado Ute Tribes water rights. The comparison in **Table 2-28** shows that under Alternative 6 a significant percentage (27 percent) of the existing irrigated acreage would have to be acquired to obtain sufficient water rights to achieve the required depletions for the new uses.

It should be noted that the estimates of the land to be acquired may be low due to the assumption that 100 percent of the historic depletion and associated diversions can be transferred to the new use. However, an actual transfer may require additional lands to be acquired to yield sufficient quantities of water on an M&I demand pattern due to: (1) possible restrictions on diversions in order to replicate the timing and location of historical return flows, and (2) losses associated with storage and conveyance of the water to the new use.

Table 2-28 Alternative 6 - Non Structural Summary of Appraisal-Level Estimate of Irrigated Acreage to be Required and Required Storage for Water Rights Acquisition Program							
Basin	Existing Non-Indian Irrigated Acreage	Alternative 6a - Water Use Scenario 1 (Leave water on land for agriculture)			Alternative 6b - Water Use Scenario 2 (Transport water to use such as M&I)		
		Acreage Required (acres)	Percent of Acres Acquired (%)	Required Storage (af)	Acreage Required (acres)	Percent of Acres Acquired (%)	Required Storage (af)
Colorado							
Pine	30,000	4,400	14.7	0	10,800	36.0	6,000 to 12,000
Animas/ Florida	35,000	5,400	15.4	0	13,100	37.4	7,000 to 14,000
La Plata	21,000	17,400	82.9	0	17,400	82.9	6,000 to 12,000
Mancos	12,000	3,300	27.5	0	3,300	27.5	2,000 to 4,000
McElmo	43,000	12,500	29.1	0	0	0.0	0
New Mexico							
Animas/ San Juan	20,000	0	0.0	0	0	0.0	0
Total	161,000	43,000	26.7	0	44,600	27.7	21,000 to 42,000

As discussed above, the evaluation of a potential water rights acquisition program is based on an analysis of the measures necessary to implement such a program and deliver water to the end uses. The change in type and place of use of the water rights will require the conversion of historical diversions and depletions from an irrigation season pattern to a year-round M&I demand pattern. Both reservoir storage and conveyance facilities will be required to effect the change of use of the water rights.

The firm (dry year) depletion factors used in estimating the amount of land to be acquired tend to minimize the amount of storage that would be required because the amount of water acquired would be on a dry year basis. However, the need to reshape the available water supply to a year-round demand pattern still exists. The historical irrigation and future M&I demand patterns were compared to estimate the percentage of the annual diversions that would occur outside the irrigation season. The monthly distribution of the historical irrigation season was estimated to be proportional to the monthly irrigation consumptive use pattern for alfalfa at Durango, Colorado as reported by the Soil Conservation Service, now the Natural Resource Conservation Service (December 1988). The monthly distribution of the future M&I demand was estimated to be equal to the demand pattern adopted by Keller-Bliesner Engineering (Bliesner 1999).

The comparison of the two demand curves determined that approximately 35 percent of the future M&I deliveries would occur outside the historical irrigation season. A factor of two has been applied to this difference resulting in a preliminary storage estimate of 35 to 70 percent of the annual demand. It should be noted that additional storage may be required to account for drought periods, any reservoir releases that may be necessary to replicate historical return flows, and system losses. The annual diversions are

then multiplied by the 35 to 70 percent factors to estimate the required storage. The results of the calculations for storage were shown previously in Table 2-28.

Conveyance facilities would also be necessary under a water rights acquisition program in order to deliver wet water to the end uses.

Use of Water from Existing Projects

A number of Reclamation projects already exist in the area of the Ute Mountain Ute and Southern Ute Indian Reservations. These project locations are shown on **Map 2-4**. Alternative 6 suggests that additional water is available or could be made available from these projects through modifications such as increasing reservoir storage and/or improving project efficiency by rehabilitating existing distribution systems, without impact to existing project beneficiaries. However, comments made by beneficiaries of these projects during the Romer-Schottler process and at public scoping meetings suggest considerable opposition to implementing such modifications.

Under this plan, the obligations for developing and funding M&I water supplies for the ALPWCD, the SJWC, and the Navajo Nation would be dealt with on the local level by the local entities themselves.

The proposal identified a number of options for the City of Durango to meet its future water needs as recognized in the 1994 Gronning Engineers report. Options include conservation measures and expansion of supplies in existing projects, particularly the Florida River, in which Durango holds water rights. Joint ventures with the Tribes may also be feasible. The proposal stated that water to meet the future needs of the New Mexico municipalities is available in the Animas River except during drought periods. Options to meet their needs during the drought periods include building storage facilities in New Mexico, using existing surplus storage capacity, and storing the water in Navajo Reservoir and exchanging streamflows at the convergence of the Animas and San Juan Rivers. Water to meet the needs of the Navajo Nation may also be available from storage in Navajo Reservoir (see Refined Alternative 6, Section 2.5.2) for a discussion on re-operation of Navajo Reservoir).

Following are the results of an analysis of the potential for obtaining water supplies through:

1. Obtaining water through irrigation system improvements.
2. Raising of existing federal dams such as Vallecito, Lemon, and McPhee.
3. Determining if there is unused water available in federal facilities, principally McPhee Reservoir.

o Obtain Water Through Irrigation System Improvements

Potential water savings and costs were computed for the Pine, Florida, and Dolores River Basins:

- **Pine River Basin**
Vallecito Reservoir stores water from the Pine River and Vallecito Creek to supply supplemental irrigation water to about 13,000 acres of Southern Ute Indian land and about 45,000 acres of non-Indian land. A gross diversion requirement of 3.28 af per acre is provided for the presently

irrigated lands which are mostly flood irrigated. The privately owned distribution systems on the Pine River Project were mostly constructed in the early 1900s. Improvements to the existing distribution systems would allow the existing diversion requirement to be reduced. The entire Pine River irrigation distribution system could be replaced with lined canals and pipe lateral systems to provide gravity sprinkler pressure water to most of the irrigated lands. Based on a study (Riley 1999b), of converting the presently flood irrigated system to an enclosed pipe and sprinkler system, the diversion requirement may be reduced to approximately 2.1 af per acre. This would result in a potential water savings of 45,000 afy for the irrigated lands under a full water supply. However, the average amount of water available over the long-term is slightly less than the amount required to provide 100 percent of the demand each year. Also, there will be years (such as 1977) in which severe shortages would exist.

- Florida River Basin

The Florida Project was designed to supply an annual average of 25,700 af of water for the irrigation of about 19,450 acres of land. However, only about 16,000 acres of this is irrigated. The project was to provide full service irrigation water to about 5,730 acres and supplemental irrigation water to about 13,720 acres of land. Lemon Reservoir, the storage facility has an active capacity of 39,000 af. Riley (1999 b) and Reclamation (1994) completed an analysis of potential water savings for the Florida Project. By converting from flood irrigation to sprinkler irrigation, a potential water savings of 16,083 afy may be realized under a full water supply. As indicated under the discussion for the Pine River, there are years when water supply shortages exist and, therefore, the total potential average annual savings of 16,083 afy would not be realized due to years which experience drought conditions. During 1956, the supply of water for irrigation was approximately one-half of the average annual demand.

- Dolores Project Area

The Dolores Project near Cortez, Colorado consists of McPhee Dam and Reservoir and a delivery network of canals and pipelines. It provides water to full service lands in the Dove Creek area and supplemental water to lands under the Montezuma Valley Irrigation Company (MVIC). Opportunities for water savings were evaluated for the full service lands and the supplemental service lands.

Evaluation of potential water savings from full service lands under the Dolores Project:

The Dolores Project delivery system for the full service lands is a new, state-of-the-art, lined canal/pressure pipe lateral system with automated controls. Due to the high efficiency of the delivery system, irrigation scheduling requirements, the relatively high price of the water, and the small volume of water allocated, essentially all of the water diverted from McPhee Reservoir is delivered to, and beneficially used, on the farm. The efficiency of delivering water to the farm is estimated to be 96 percent. The water delivered to the Dove Creek area is 1.95 af per acre and the water delivered to the Towaoc area is 3.05 af per acre. The difference in water requirements for these two areas is that the Dove Creek area is significantly higher in elevation than Towaoc, which results in about 55 fewer frost-free days and a much shorter growing season. Both areas have implemented sprinkler irrigation as the method of irrigation. Therefore, there are no apparent additional water saving opportunities in this system for the full service irrigated lands.

Map 2-4 Location of Existing Federal Water Projects within the Project Area

[back page of Map 2-4]

Evaluation of potential water savings from supplemental service lands under the Dolores Project:

The MVIC has rights to irrigate 43,000 acres of land. Of these lands, 37,500 acres have rights senior to the Dolores Project. Due to the poor soils and land classification of the lands, the Dolores Project provides water to only 26,300 acres of these lands. MVIC receives supplemental water for irrigation of these 26,300 acres of land during the late irrigation season when its private water supply is short. While portions of the MVIC delivery system were combined with facilities of the Dolores Project and other portions rehabilitated as salinity control features, a portion of the system remains as unlined canals and laterals. Improvements could be made to the MVIC system to improve water delivery efficiency, on-farm efficiency, and to allow for better management to minimize operational waste.

Riley (1999) completed an evaluation of water savings potential for the MVIC. In an average year, the potential water savings would be 34,000 afy under a full water supply. In years of short water supply the full amount of water demand for the irrigated lands would not be available. For example, during the dry year of 1977, the amount of water available during the irrigation season was 24,000 af, whereas the demand for the MVIC system was approximately 120,000 af.

- Assured Water Supply Versus Potential Water Savings

The water savings computed above would be correct if a full water supply was available each year. For Reclamation projects, M&I uses are allocated a firm supply of 100 percent every year, but agricultural uses are reduced in water-short years. A criterion that is used as a guideline for acceptable shortages to agricultural use is that there should not be more than 50 percent shortage in 1 year of the yearly irrigation demand, not more than a cumulative 75 percent shortage in 2 consecutive years of the yearly irrigation demand, and not more than a cumulative 100 percent shortage in any 10 consecutive years of the yearly irrigation demand. Federal reservoirs are designed to meet these criteria. The projects which receive water from these reservoirs were sized to match the available water supply. An example is provided to illustrate this concept:

Florida Project (Lemon Reservoir) Shortage to irrigation in 1956 was 45 percent

Dolores Project (McPhee Reservoir) Shortage to irrigation in 1955 was 39 percent.

Therefore, the dry period of record is critical in determining the firm or assured water supply. During dry years, reservoirs generally do not fill to maximum capacity and the filling period ends earlier in the spring, which results in more water being released from storage to meet demands. Shortages occur when the volume of storage does not equal the volume of demand. Shortages are administered by the operating entities according to agreements with Reclamation, so each irrigation water user shares equally in project water shortages. M&I water users are usually contractually guaranteed a full supply of water even during periods of project water shortages.

Table 2-29 shows a comparison of potential water savings with an assured water supply firm yield from water conservation measures.

Table 2-29 Estimate of Firm or Assured Water Supply for M&I Uses					
Location	Irrigated Acreage (acres)	Type of Improvement	Potential Water Savings (af)	M&I Firm Yield	
				Assume Irrigators Will Limit Diversions to 50% of Demand in Critical Dry Year (af)	Assume Irrigators Will Exercise All Senior, Junior and Storage Rights in Critical Dry Year (af)
Pine River	45,000	Convert 45,000 acres to pipelines and sprinklers	45,000	0	0
Florida River	16,500	Convert 16,500 acres to pipelines and sprinklers	16,000	7,000	0
Montezuma Valley	35,000	Convert 26,000 acres to pipelines and sprinklers	34,000	12,800	0
Totals	96,500		109,000	19,800	0

Based on the concept of firm yield, the amount of water available from water conservation would be zero if the irrigators exercise all senior, junior, and storage rights. Assuming another entity was to pay for the improvements, there is a likelihood that irrigators would be willing to limit their diversions in a critical dry year to one-half of what they would normally require to grow their agricultural crops, then the firm yield would be 19,800 afy.

o Raising of Existing Federal Dams

The possibility of raising three federal dams in the project area to increase storage capacity was considered. These dams were Vallecito Dam located on the Pine River, Lemon Dam located on the Florida River, and McPhee Dam located on the Dolores River. (Note: non-federal dams were considered as a part of Refined Alternative 6 and are discussed under Section 2.5).

- Raising of Vallecito Dam

It was generally agreed that raising Vallecito Dam would not be feasible due to the social and economical impacts associated with inundating the community surrounding the lake. In order to gain any additional water in Vallecito Reservoir, the existing irrigation water delivery facilities within the Pine River Basin would need to be rehabilitated. In the discussion above, this has limited value when one considers the concept of firm yield.

- Raising of Lemon Dam

Of the three dams being considered, Lemon Dam provides the most merit for increasing storage capacity. Therefore, an appraisal-level analysis was completed of raising Lemon Dam. The cost would be \$28 million to gain an additional capacity of 10,000 af, which would result in a firm yield of 500 to 2,000 af. Additional studies will be needed to confirm this yield.

- Raising of McPhee Dam

It would be physically possible to enlarge McPhee Dam, but an enlarged reservoir would inundate the town of Dolores, Colorado.

O Unused Water in Federal Facilities

The reservoir discussed by the Animas River Citizens Coalition Conceptual Alternative (August 1997) (now Alternative 6) as having unused water was McPhee Reservoir, located on the Dolores River near Cortez, Colorado.

- * Evaluation of Drawing Upon the Inactive Pool of McPhee Reservoir

Meeting water supply demands from the inactive storage pool in McPhee Reservoir is not practical. Pumping from the inactive storage would reduce the volume and frequency of spills which would have an adverse affect on recreational boating and the trout fishery below the dam. In addition, rafting is very popular on the Dolores River downstream from McPhee Dam and the sport is entirely dependent on water that is in excess of storage capacity. Rafting opportunities on the Dolores River were adversely affected by the Dolores Project and, as a mitigation measure, Reclamation committed to manage spills to maximize rafting opportunities. Studies of the trout fishery in the Dolores River below McPhee Dam have indicated that high spring flows are also necessary to sustain the quality of the fishery. An additional use from storage (active or inactive) would reduce the volume and frequency of spills and adversely affect rafting and the trout fishery. Sufficient water to fill McPhee Reservoir is only available 50 percent of the time, indicating that a limited volume of water would be available on an annual basis from inactive storage.

- * Assessment of the Under Utilization of Stored Water in McPhee Reservoir

The Hydrosphere Report (1995) and the Animas River Citizens Coalition Conceptual Alternative (1997) stated that unused water in McPhee Reservoir could be used to satisfy Colorado Ute Tribal water rights claims. Five-thousand af of storage allocated to M&I water use was identified as presently not used. The Hydrosphere Report (1995) identified a second potential source of unused water:

The Dolores Project was designed to deliver 91,000 acre-feet of Project water for irrigating 54,000 acres. So far, less than 50% of this water is actually being delivered and used.

The first area concerns the 5,000 af of M&I water that is not presently being utilized but which Reclamation has contracted with the Dolores Water Conservancy District (DWCD). The DWCD holds 5,120 af of M&I water, of which 4,985 af is not under agreement with local water users for use. In a conversation with officials of the DWCD (July 1999), it was stated that in a vote of stockholders during 1995, the district agreed to pay for the water and consider this 5,000 af to be part of their long-term water supply for future generations of these areas. The future M&I demand for the Montezuma County area is projected to increase from nearly 5,000 af at the

present time to 12,000 af by the year 2050. This 5,000 af of presently unused M&I water in McPhee Reservoir would be used to supply water for this future growth.

The second potential source of unused water comes from the presumption that the water stored in McPhee Reservoir is presently under-utilized. The reservoir was designed to provide carryover storage during times of drought to supply at least 50 percent of the irrigation demands of the project. There will be many years when the storage in McPhee Reservoir is not drawn upon in its entirety. However, during a drought that is representative of historical records, the reservoir will be drawn upon heavily. Because, as noted above, irrigation projects are designed to tolerate a shortage of 50 percent in the most extreme dry year and M&I projects are designed to provide a 100 percent water supply even in the drought years, no unused water exists in McPhee Reservoir.

Costs for Options of Purchasing Land

Scenario 1 (Alternative 6a) of leaving water on the land for agricultural use would require 43,000 acres of land to provide a depletion of 53,200 afy. The estimated cost for this scenario would be approximately \$219 million over a 10-year time frame to make these purchases.

Scenario 2 (Alternative 6b) of purchasing the water and making it available for M&I use would require 44,600 acres of land to provide a depletion of 53,200 afy. The appraisal-level cost for this would be approximately \$260 million. In addition, a cost for a storage reservoir to provide a capacity of 21,000 to 42,000 af to receive and hold such water would be required to provide the firm yield required for M&I water. Since the water would be obtained in different river basins, several small reservoirs may need to be constructed. While an appraisal-level estimate has not been completed for the required storage, the estimate for Aztec Reservoir in Alternative 8 could be used as a guideline. This reservoir has a capacity of 20,000 af and the estimated cost is \$84 million. Therefore, for Scenario 2, an appraisal-level estimate of cost would be a minimum \$344 million.

Costs for Obtaining Water from Existing Projects

Appraisal-level costs were calculated for: (1) obtaining water through irrigation system improvements in the Pine, Florida, and Dolores River Basins; and (2) the raising of Lemon Dam. Additional details on the appraisal level costs for irrigation systems improvements are contained in a report by Riley (1999). A summary of those costs is presented in **Table 2-30**. It is important to note that the computations also demonstrate that the firm yield from the three river basins is 19,800 af. The costs shown in Table 2-30 also include costs for mitigation.

Appraisal-level cost estimates were made for the raising of Lemon Dam by an additional 10 feet. This would provide additional storage space for 10,000 af of water with an expected yield of 500 af of water on an annual basis. The cost estimate for raising Lemon Dam is estimated at \$28 million.

Other opportunities for obtaining water from existing projects did not have enough merit to pursue completing a cost estimate (i.e., raising of McPhee Dam and Vallecito Dam and availability of unused water in McPhee Reservoir).

It is important to note that there is a significant difference in the costs for Alternative 6 over what was originally envisioned by the proponents of Alternative 6. The following is a quote from the proponents report:

There are a number of different combinations of these two elements that could be used to satisfy the obligation of the Tribes. Costs could vary depending on how the elements are implemented. The costs of implementing two plausible combinations of the elements were analyzed by the sponsors of the alternative and ranged from about \$113 million to \$158 million.

Table 2-30 Appraisal-Level Cost Estimate Irrigation Systems Improvement (Cost Includes Mitigation for Impacts)				
Location	Appraisal-Level Cost	Potential Water Savings (af)	M&I Firm Yield	
			Assume Irrigators Will Limit Diversions to 50% of Demand During the Critical Dry Year (af)	Assume Irrigators Will Exercise All Senior, Junior and Storage Rights in Critical Dry Year (af)
Pine River	\$254 million	45,000	0	0
Florida River	\$67 million	16,000	7,000	0
Montezuma Valley	\$71 million	34,000	12,800	0
Totals	\$392 million	109,000	19,800	0

Depletion amounts shown in Table 2-7 are considerably lower than the 2.5 af per acre value used by the Animas River Citizens Coalition Conceptual Alternative. An average depletion factor for all the river basins in Table 2-7 is 1.4 af per acre. Considerably more land would, therefore, need to be purchased than originally estimated.

2.3.2.6.3 Environmental Impacts Associated with Alternative 6

Table 2-31 provides a summary of the environmental impacts associated with Alternative 6.

2.3.2.6.4 Evaluation of the Capability of Alternative 6 to Meet Purpose and Need Requirements of the Project

Table 2-32 contains an outline of the capability of Alternative 6 to meet the purpose and need. However, as stated in Section 2.3.1.3, these factors should be evaluated in light of the elements of an Indian water rights settlement.

2.3.2.6.5 Evaluation of the Technical and Economic Merits of Alternative 6

Table 2-33 summarizes the evaluation of technical and economic factors of Alternative 6.

Table 2-31 Alternative 6 Impacts to Significant Environmental Resource Areas			
Resource Area	Description of Significant Environmental Resource Areas		
	Purchase of Land and Water Rights		Use of Water from Existing Projects for M&I
	Scenario 1 - Leave Water on the Land	Scenario 2 - Remove Water from Land for M&I Use	
Aquatic	There would be no new impacts if Tribes continued to farm.	Could be little change if water in the case of the Pine River is allowed to flow to Navajo Reservoir and then be released for M&I use to New Mexico communities.	Same as described under Scenario 2.
Cultural	There would be no new impacts if Tribes continued to farm.	Estimate of 50 cultural resource sites could be impacted from removing water from land. The number of sites could be much higher depending on sites chosen for storage reservoirs and location of conveyance facilities.	The number of sites would depend on what additional sites are needed for storage facilities and the location of conveyance facilities.
Hydrology	There would be no new impacts if Tribes continued to farm.	Could be slight positive or negative changes over historical flows depending on the length of the stream channels to which the water was left before being diverted for M&I use.	Same as described under Scenario 2.
Recreation	There would be no new impacts if Tribes continued to farm.	Few impacts to Animas River recreation if water in streams is maintained as at present.	Potential impacts to recreation at Lemon Reservoir.
Socioeconomics (Structural)	There would be no new impacts if Tribes continued to farm.	Construction impacts associated with storage reservoir of 20,000 to 40,000 af.	Construction costs of \$28 million for Lemon Dam enlargement.
Socioeconomics (Non-Structural)	This alternative would involve the purchase of 27% (or 43,000 acres) of the irrigated land in the project area. This would displace a significant number of farmers. There would be the positive benefit of \$220 million available to the farmers for purchase of their lands.	This alternative would involve the purchase of 27% (or 44,600 acres) of the irrigated land in the project area. This would displace a significant number of farmers. In the La Plata River Basin, approximately 82% of the non-Indian irrigated lands would be purchased. There would be the positive benefit of \$260 million available to the farmers for purchase of their lands.	Positive benefit of \$392 million from improvement in irrigation systems. Benefits would occur to the local economy from purchase of materials and construction of the improved irrigation systems.
Threatened/Endangered Species	There would be no new impacts if Tribes continued to farm.	Potential negative impact on the southwest willow flycatcher through loss of habitat.	Same as described under Scenario 2.

Table 2-31 (continued)
Alternative 6
Impacts to Significant Environmental Resource Areas

Resource Area	Description of Significant Environmental Resource Areas		
	Purchase of Land and Water Rights		Use of Water from Existing Projects for M&I
	Scenario 1 - Leave Water on the Land	Scenario 2 - Remove Water from Land and Use for M&I	
Water Quality	There would be no new impacts if Tribes continued to farm.	Overall, the change would be slightly negative or slightly positive from historical conditions depending on how the water was transferred.	Same as described under Scenario 2.
Wetlands	There would be no new impacts if Tribes continued to farm.	There would be a loss of 1,400 acres of wetlands.	There would be a potential loss of 6,000 to 8,000 acres of wetlands through irrigation systems improvement.
Wildlife	There would be no new impacts if Tribes continued to farm.	Loss of wildlife habitat that presently exists on 44,600 acres of irrigated land would occur.	Approximately 87,500 acres of irrigated land would be converted to sprinkler irrigation systems. As a result, there would be a potential loss of 3,000 acres of wildlife habitat of riparian vegetation and native trees.

<p align="center">Table 2-32 Alternative 6 Evaluation of Capability of Alternative to Meet the Purpose and Need</p>			
Evaluation Factor	Description of Capability to Meet this Requirement		
	Purchase of Land and Water Rights		
	Scenario 1 - Leave Water on the Land	Scenario 2 - Remove Water from Land for M&I Use	
Water Yield	This component would supply the required water yield of 62,200 afy for diversion (53,200 afy depletion) under the Settlement Act, but on a water yield basis normally associated with agriculture. It would not allow for use as M&I and the requirement for a firm yield.	This component would supply the required water yield of 62,200 afy for diversions (53,200 afy) under the Settlement Act.	Water yield would consist of 19,800 af from irrigation systems improvements and 2,500 af from Lemon Dam enlargement. This is considerably less than the required 62,200 af diversion under the Settlement Act. Therefore, this component would not pass the test for water yield.
Reliability	The water yield would be renewed on an annual basis but would follow the pattern of historical shortages associated with irrigation projects.	The water yield would be renewed on an annual basis with additional storage required to supply the firm M&I yield.	The required yield of 62,200 afy for diversion would not be renewed on an annual basis and, therefore, this component would fail the test of reliability.
Location	This component would rate high in terms of location because the lands are located where the water supply exists.	This component would rate high in terms of location because the water sources are located in the respective river basins where the M&I needs may be located.	This component would provide some water in the desirable locations but the amount would be insufficient to meet the requirements of the Settlement Act.
Practicability	This component would rate low in terms of practicability because the purchase of 43,000 acres of irrigated land in the project area represents approximately 27% of the non-Indian irrigated lands. To purchase this amount of land in contiguous blocks and immediately adjacent to reservation boundaries would not likely occur.	This component would rate low in terms of practicability. This is a result of the purchase of 44,600 acres of irrigated land in the project area. This represents approximately 27% of the non-Indian irrigated lands. The possibility of purchasing this amount of land is highly questionable.	The concept of irrigation systems improvement is practicable, but from discussions with local farming residents, documents developed during the Romer-Schoettler process, and comments received during public scoping, it would be highly unlikely that all farmers would be willing to accept an improvement in their irrigation system if they had to relinquish some of their past diversions. The Lemon Dam enlargement is practicable. Overall, this component would receive a low to moderate rating for practicability.

Table 2-33 Alternative 6 Results of the Evaluation of the Technical and Economic Factors			
Technical and Economic Category	Description of Results		
	Purchase of Land and Water Rights		Water from Existing Projects for M&I Use
	Scenario 1 - Leave Water on the Land	Scenario 2 - Remove Water from Land for M&I Use	
Indian Trust Assets	This would not meet the Colorado Ute Tribes ITAs because the trust assets include M&I water, not irrigation.	This alternative would satisfy the Colorado Ute Tribes ITAs by satisfying the water rights claims of the Tribes as quantified in the Settlement Act.	This component would not satisfy the Colorado Ute Tribes ITAs because it would only supply 22,300 afy of water.
Feasibility	The feasibility of purchasing 43,000 acres of land is highly questionable. Therefore, this component would rate low to moderate in terms of feasibility.	The feasibility of purchasing 44,600 acres of land is highly questionable. Therefore, this component would rate low to moderate in terms of feasibility.	This component would not be feasible in that it would not supply the required water yield. There is local opposition to the purchase of irrigated lands.
Development Costs	The cost of this scenario would be \$220 million.	The cost of this scenario would be \$260 million for the purchase of irrigated land and another \$80 million for storage. Therefore, the total cost would be \$340 million.	The cost would be \$392 million for irrigation systems improvements and \$28 million for Lemon Dam enlargement. This total cost of \$420 million would only supply 22,300 afy of firm yield.
Operation, Maintenance, and Replacement Costs	The operation and maintenance costs for flood irrigation would be approximately \$1.50 per acre, or \$64,500 per year. There would be no cost for replacement.	Costs would be dependent upon location, type of facilities, and water use.	Operation and maintenance costs for sprinkler irrigation would be approximately \$1.00 per acre or \$87,500 per year. For a 50-year period, the sprinklers would need to be replaced twice, which would result in an annualized replacement cost of \$1.4 million.
Public Safety	There would be no impact to public safety.	Overall, low impact with the construction of new storage facilities.	Overall, safety could be increased with the Lemon Dam enlargement, which could be constructed to enhance safety below the dam on the Florida River.
Impacts to Ongoing Operations	Would have impacts to local agricultural economy in La Plata and Montezuma Counties. A significant number of farmers would be displaced through the purchase of more than 43,000 acres of existing non-Indian irrigated farmland. This would represent approximately 27% of the total irrigated farmland in La Plata and Montezuma Counties.		There would be significant impacts in the change in operation of federal reservoirs. This could be an impact to present users.

2.3.2.7 Alternative 7 - 1996 Final Supplement to the Final Environmental Statement Recommended Action

2.3.2.7.1 Structural Component

This alternative, as documented in the 1996 FSFES, would divert flows of the Animas, La Plata and San Juan Rivers for irrigation and M&I uses. It would also provide for fish and wildlife preservation, recreation facilities, and a cultural resources program. This alternative as proposed would satisfy the ALP Project's portion of the Colorado Ute Tribes' water rights claims as specified by the 1988 Settlement Act.

This alternative would provide a total water depletion of 149,220 afy. The project would be constructed and operated in two phases in accordance with the 1986 Settlement Agreement; the December 10, 1986 Binding Agreement for ALP Project Cost Sharing; and the 1988 Settlement Act. In addition, the 1996 Reasonable and Prudent Alternative (RPA) in the U.S. Fish and Wildlife Service's (Service) Biological Opinion on the project limited initial project water depletions to an average 57,100 afy. Because of the RPA and the resulting 57,100 af average annual depletion limitation to the San Juan River, the first phase was separated into two distinct stages (A and B).

M&I water would be provided in Colorado and New Mexico. The Colorado Ute Tribes and the City of Durango along with rural areas in Colorado, such as subdivisions west of Durango and the rural La Plata River areas, would receive M&I water. New Mexico entities that would receive M&I water include Farmington, Bloomfield, Aztec, rural water districts, and part of the Navajo Nation near Shiprock.

Irrigation water would be provided to the Colorado Ute Tribes and to non-Indian entities in Colorado and New Mexico. Recreation facilities would also be developed at Ridges Basin and Southern Ute Reservoirs.

Under this alternative, major facilities of the project would include the Durango and Ridges Basin Pumping Plants, Ridges Basin Inlet Conduit, Ridges Basin and Southern Ute Reservoirs, La Plata and Southern Ute Diversion Dams, Dry Side Canal, and various other canals and laterals. Ridges Basin Reservoir would store approximately 274,000 af of water behind an earth-filled dam. The reservoir would be slightly over 4 miles at its longest point, similar in size to nearby Vallecito Reservoir. To supply water demands west of the reservoir, water would be pumped by the Ridges Basin Pumping Plant into the Shenandoah Pipeline and Dry Side Canal. The canal would carry water to meet the needs of both Colorado and New Mexico irrigators and M&I demands in the La Plata River Basin. Pipe laterals would be constructed from the Dry Side Canal to the farms. Pressure for sprinkling would be developed by gravity on most of the laterals and by pumping plants on the remainder. With this system, water would be supplied to those lands presently without irrigation and to those with only a limited supply.

A Cost Sharing Agreement was signed for the project on June 30, 1986. A principal element of the Cost Sharing Agreement was dividing the construction of the project into two phases, Phase I and Phase II, and associated cost sharing obligations. The cost of constructing Phase I would be shared by federal and non-federal participants. Construction of Phase II would be the responsibility of non-federal participants.

2.3.2.7.2 Non-Structural Component

There is no non-structural component to Alternative 7.

2.3.2.7.3 *Environmental Impacts Associated with Alternative 7*

Table 2-34 provides a summary of the environmental impacts associated with Alternative 7.

<p style="text-align: center;">Table 2-34 Alternative 7 Impacts to Environmental Resource Areas</p>	
Resource Area	Description of Impacts
Aquatic	<p><u>Phase I, Stage A</u> - There would be very little impact to the trout and native fish in the Animas River.</p> <p><u>Phase I, Stage B</u> - There would be a greater chance of impact to trout and native fish from the further depletion in this phase.</p> <p><u>Phase II</u> - With the additional depletion, there would be an additional impact on resident trout and native fish in the Animas River.</p> <p>A reservoir for coldwater fishery could be established for all phases and stages of the project.</p>
Cultural	From the 1996 FSFES the number of cultural resource sites that could be affected would be on the order of 3,500 for the full-sized project.
Hydrology	<p><u>Phase I, Stage A</u> - Would meet flow recommendations. Minor adjustments may be required to meet senior water rights with baseline depletions.</p> <p><u>Phase I, Stage B</u> - Would not meet flow recommendations.</p> <p><u>Phase II</u> - Would not meet flow recommendations.</p>
Recreation	Recreation impacts would be similar to Alternative 1, only with a larger pool.
Socioeconomics (Structural)	Due to the higher construction cost of this alternative the impact to the local economy would be significantly greater than the other structural alternatives.
Socioeconomics (Non-Structural)	There is no non-structural component to Alternative 7.
Threatened/Endangered Species	<p><u>Phase I, Stage A</u> - The flow recommendations for endangered fish in the San Juan River could be met.</p> <p><u>Phase I, Stage B</u> - The flow recommendations for endangered fish in the San Juan River could not be met, therefore, there would be a negative impact on endangered fish.</p> <p><u>Phase II</u> - Same as described in Phase I, Stage B.</p>
Water Quality	<p><u>Phase I, Stage A</u> - The water quality in the Animas River would be affected less than that under Alternative 1.</p> <p><u>Phase I, Stage B</u> - The impact to water quality in the Animas River would be greater than under Alternative 1 and the return flow from irrigated lands would cause some water quality degradation in the La Plata and San Juan Rivers.</p> <p><u>Phase II</u> - Essentially the same as for Phase I, Stage B with the exception that there would be more return flows and some of the return flows would drain into the Mancos River.</p>
Wetlands	Same as described under Alternative 1 for Phase I, Stage A. Over 200 acres of wetlands and habitat supported by canal leakage would be lost for Phase I, Stage B and Phase II.
Wildlife	The reservoir size at Ridges Basin would be 274,000 af versus the 90,000 af size in Alternative 1. This would result in a significant increase in loss of wildlife habitat over that in Alternative 1. The loss in habitat would be very close to that of Alternative 5.

2.3.2.7.4 *Evaluation of the Capability of Alternative 7 to Meet Purpose and Need Requirements of the Project*

Table 2-35 summarizes the evaluation of the capability of Alternative 7 to meet the purpose and need.

Table 2-35 Alternative 7 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Phase I would only provide 32,500 afy for the Colorado Ute Tribes, which is considerably less than the diversion of 62,200 afy (53,200 afy depletion) required under the Settlement Act. Phase I, Stage B and Phase II would provide the required water needed to satisfy the Settlement Act.
Reliability	The water supply would be renewed by the hydrologic cycle.
Location	Ridges Basin Dam and associated facilities would be located in close proximity to the majority of the needs of the Colorado Ute Tribes.
Practicability	This alternative would be practicable in that the project could be implemented, and would meet the Settlement Act requirements.

2.3.2.7.5 *Evaluation of the Technical and Economic Merits of Alternative 7*

Table 2-36 summarizes the evaluation of the technical and economic factors of Alternative 7.

Table 2-36 Alternative 7 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	When combined, Stage A and Stage B of Phase I would provide the required water to satisfy the Colorado Ute Tribes ITAs. Development of the project would impact the Jicarilla Apache Tribe and the Navajo Nation in that it would be more difficult to develop more water from the San Juan River.
Feasibility	This alternative is feasible in that the project could be constructed. The staging operation would not be a highly desirable type of operation.
Development Costs	The cost of Phase 1, Stage A is estimated to be \$246 million. The cost for the total project would be over \$600 million (1995 prices)
Operation, Maintenance, and Replacement Costs	Annual operation and maintenance costs would be approximately \$3.8 million.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.8 **Alternative 8 - Administration Proposal with an Alternative Water Supply for Non-Colorado Ute Indian Entities**

2.3.2.8.1 **Structural Component**

This component would be the same as Alternative 1 with the exception that M&I water for the Navajo Nation and SJWC would be supplied from sources other than the proposed Ridges Basin Reservoir. Aztec Reservoir (see Map 2-2) was evaluated as an alternative water supply for these entities. Water would be supplied to Aztec Reservoir by pumping from the Animas River. The ALPWCD would use Ridges Basin Reservoir because Aztec Reservoir is too far from the ALPWCD service area.

Reclamation's hydrological model ALPOS calculated an active storage amount of 67,700 af for the Colorado Ute Tribes only, and an amount of 89,400 af for the Administration Proposal, including all entities. Proportioning the difference of 21,700 af, the ALPWCD share of 3,680 af would be stored at Ridges Basin for a total active storage requirement of 71,380 af. Aztec Reservoir would contain the SJWC share of 14,710 af and the Navajo Nation share of 3,310 af, for a total of 18,020 af. In addition, 2,000 af would serve as an operational minimum, including dead storage and flood surcharge for a total reservoir size of about 20,000 af at Aztec Reservoir. At Ridges Basin, 3,600 af would provide an operational minimum over the level of the outlet works for a total reservoir size of 75,000 af.

2.3.2.8.2 **Non-Structural Component**

Alternative 8 includes the same non-structural element included in Alternative 1 which would establish and utilize a water acquisition fund which the Colorado Ute Tribes could use to acquire water rights up to approximately 13,000 afy of depletions. The following assumptions and guidelines were adopted for use in evaluating potential water rights acquisition for the 15,340 afy of depletions under this alternative:

1. Consumptive use of water would be restricted to M&I uses only and would be allocated to the non-Colorado Ute Tribe entities in the following manner:

		<u>Depletion</u>
Animas-La Plata Water Conservancy District	=	2,600 afy
Navajo Nation	=	2,340 afy
San Juan Water Commission	=	<u>10,400 afy</u>
Total	=	15,340 afy

2. The projected possible M&I uses would be provided on a firm (dry year) basis under typical M&I demand patterns.
3. The possible uses identified for this exercise represent reasonable estimates for purposes of evaluating potential impacts.
4. The projected possible M&I uses would be met by water rights acquisitions within the basin wherein the use would occur.

5. Basin-wide, firm (dry year) depletion factors are used in this analysis for estimating the amount of land to be acquired. It is recognized that implementation of an acquisition program would require evaluation of specific depletion factors and other considerations on a right-by-right basis.
6. Firm (dry year) depletion factors are used for determining the amount of land to be acquired. This would tend to minimize the volume of the required storage reservoirs that are necessary to reshape the historical diversions and depletions of water rights used under an irrigation season demand pattern when converted to M&I purposes on a year-round demand schedule.
7. For the purposes of this analysis, the targeted water rights would be obtained in the following basins:
 - a. ALPWCD target area is the Animas River in Colorado
 - b. Navajo Nation target area is the Animas and San Juan Rivers in New Mexico.
 - c. SJWC target area is the Animas and San Juan Rivers in New Mexico.

The existing non-Indian irrigated acreage within the Animas/San Juan River Basin in New Mexico is approximately 20,000 acres. Of this amount, approximately 10,920 acres would need to be purchased to satisfy a portion of the non-structural component of Alternative 8 (see **Table 2-37**). This represents approximately 55 percent of the non-Indian irrigated lands. It should be noted that the estimates of the land to be acquired may be low due the assumption that 100 percent of the historic depletion and associated diversions can be transferred to the new use. However, an actual transfer could require additional lands to be acquired to yield sufficient quantities of water on an M&I demand pattern due to: (1) possible restrictions on diversions in order to replicate the timing and location of historical return flows, and (2) losses associated with storage and conveyance of the water to the new use.

Table 2-37 Alternative 8 Non-Structural Component		
River Basin	Estimated Depletion (afy)	Acreage Required (acres)
Animas River in Colorado	2,600	1,900
Animas/San Juan River in New Mexico	12,740	10,920
Total	15,340	12,800

2.3.2.8.3 *Environmental Impacts Associated with Alternative 8*

Table 2-38 provides a summary of the environmental impacts associated with Alternative 8.

Table 2-38 Alternative 8 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	This alternative includes a pumping plant for Aztec Reservoir and Ridges Basin Reservoir. This project configuration would have a greater impact on native fish reproduction and recruitment in the Animas River than Alternative 1. Timing of pumping would be set to minimize impacts on the fishery.
Cultural	Same as described under Alternative 1 with the exception that additional sites are known to exist in the Aztec Reservoir Site.
Water Resources/ Hydrology	Hydrologic impacts from this alternative would be a little different from Alternative 1. Flows in the Animas River would be less altered between the Durango Pumping Plant and the diversion to Aztec Reservoir, improving the probability of meeting downstream water rights and instreamflow requirements. If the two reservoirs are sized to deliver project water and meet flow requirements for endangered fish, there would be no negative impact to water supply. Without inclusion of capacity to support the flow recommendations, water supply would be negatively impacted and the habitat for endangered fish adversely impacted.
Recreation	The size of Ridges Basin at 75,000 af is less than Alternative 1. The recreation potential on Ridges Basin would be small to probably none. The pumping from the Animas River could have even greater impacts on fishery and endangered species because of the pumping at Aztec. Pumping from the Animas River below Durango would have lesser impacts than the other structural alternatives with Ridges Basin.
Socioeconomics (Structural)	If both Ridges Basin and Aztec were constructed, the impact would be similar to that of Alternative 1.
Socioeconomics (Non-Structural)	Impacts could be negative if the Colorado Ute Tribes were to purchase approximately 55% of non-Indian irrigated acreage within the Animas/San Juan River Basin in New Mexico. If the land is transferred into trust land, there would be a negative impact to the local tax base. If the Colorado Ute Tribes used the \$40 million water acquisition fund for economic development activities, it would have a positive impact on the economy.
Threatened/ Endangered Species	The impact on endangered fish downstream in the San Juan River was not determined but the reservoir at Aztec could be sized in conjunction with the size of Ridges Basin to meet the flow requirements for endangered fish.
Water Quality	Same as described under Alternative 1.
Wetlands	Same as described under Alternative 1.
Wildlife	The combined reservoir size of Ridges Basin and Aztec would be 95,000 af. The loss of wildlife habitat would be similar to that of Alternatives 1 and 3.

2.3.2.8.4 *Evaluation of the Capability of Alternative 8 to Meet Purpose and Need Requirements of the Project*

Table 2-39 summarizes the evaluation of the capability of Alternative 8 to meet the purpose and need.

Table 2-39 Alternative 8 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	This alternative would provide the required water yield to satisfy 57,100 afy depletion for the structural component and establish a water acquisition fund that could be used to acquire approximately 13,000 afy depletion on a willing buyer/willing seller basis for the non-structural component. This alternative would not provide the required water supply.
Reliability	This alternative would provide the required water yield on a long-term annual basis, and has a medium rating for reliability.
Location	This alternative would rate equally in location to Alternatives 1, 2, 3, and 4, and therefore a medium rating for location was assigned. This alternative would have two reservoirs, one at Ridges Basin and the other at Aztec, to serve the needs of the water users.
Practicability	The development of this alternative is technically feasible. Substantial investigations have been conducted at the Ridges Basin Dam site to verify that a safe dam can be constructed. There are some safety concerns for potential falling rim rock at the Aztec Reservoir site. There is an impediment from an endangered species standpoint. The pumping schedule proposed for this alternative could prevent the flow recommendations from being met on the San Juan River during project operation. This would result in a very low ranking as far as practicability is concerned. This alternative would fail the test of practicability.

2.3.2.8.5 *Evaluation of the Technical and Economic Merits of Alternative 8*

Table 2-40 summarizes the evaluation of technical and economic factors of Alternative 8.

Table 2-40 Alternative 8 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under Alternative 1.
Feasibility	Ridges Basin and Aztec Reservoir are feasible to construct. Implementing a water rights purchase program in New Mexico would be expensive and difficult to carry out.
Development Costs	The cost for the structural component of a 75,000 af dam and reservoir at Ridges Basin is estimated to be \$154 million. To satisfy the non-Colorado Ute Tribe entities water needs of 15,340 afy depletion, two options were evaluated. One consisted of a 20,000 af dam and reservoir at Aztec with an estimated cost of \$72 million. The second option would be the purchase of 12,800 acres of land, which is estimated to cost \$206 million. Therefore, the total cost could range from \$226 million to \$360 million, plus the \$40 million for the water acquisition fund.
Operation, Maintenance, and Replacement Costs	Same as described under Alternative 1.
Public Safety	Safe dams can be constructed at Ridges Basin and Aztec Reservoir Sites. There are some safety concerns for potential falling rim rock at the Aztec Reservoir site. There are no active hazardous waste sites in the project area.
Impacts to Ongoing Operations	Same as described under Alternative 1.

2.3.2.9 Alternative 9 - Citizens' Progressive Alliance Alternative

2.3.2.9.1 Structural Component

There is no structural component to Alternative 9.

2.3.2.9.2 Non-Structural Component

This alternative is based on providing the Colorado Ute Tribes a choice between (1) a revenue stream derived from each principal's undiverted water supply (opportunity costs), (2) available water from existing federal storage facilities, of which there are five in the general area, or (3) some combination of the two. Construction of new storage or delivery facilities would occur only to the extent the benefitting entities choose to finance these activities out of their revenues.

An estimate of the value of opportunity costs associated with the resource that would be consumed by the ALP Project is composed of a number of elements.

Revenue Stream from Opportunity Costs of Undiverted Water

- Hydropower
- Salinity Control Costs
- Endangered Species
- Operation and Maintenance
- Administrative

o Value of Opportunity Costs Associated with Hydropower

The ALP Project would deplete the flows of water from the San Juan River by 57,100 afy beyond what has been depleted historically. There are a variety of opportunity costs, or public costs, associated with removing this water from the river. One component of the opportunity cost can be associated with its use by lower basin users on the Colorado River. The proponents of the Citizens Progressive Alliance Alternative (Alternative 9) state that - *"No attempt is made to value instream flows for fisheries, recreation, and aesthetics, even though they clearly have tremendously high positive values for the nation's citizenry, and people of Colorado in particular. Instead, the opportunity cost of depleting the [Colorado] river is based on the value of the hydropower that can be generated if the water remains in-river. This opportunity cost is clear and subject to less controversy."* (Romer-Schoettler process, August 13, 1997).

The value of opportunity costs associated with hydropower under Alternative 9 assumes that the power for the ALP Project would displace power that could be utilized elsewhere and that the cost of this power would be higher in supplying other sources.

The U.S. Department of Interior, Bureau of Reclamation Report 1-27-97 VI. Power Revenues, Romer/Schoettler process stated:

... There is no net revenue gain to the federal government by eliminating the power generation requirements of A-LP and continuing to market that power. The power is marketed at the same rate as it would be marketed at A-LP.

and,

. . . Under current law, there is no authorization for an entity to resale project power, and therefore, there is no theoretical or real income to the Ute Tribes or any other entity from project power sales. While the concept of tribal water without the existence of ALP is problematic, for the sake of discussion we will assume that new legislation is enacted that established both the Tribal water rights and compensation to the Tribes for power resale.

For purposes of this analysis, Reclamation (1995) determined what the loss of downstream power generation could be, assuming that the current obstacles could be overcome. The following is an excerpt from that report:

As a result of the [ALP] Project related stream depletion of [57,100] afy of water, power generation downstream from the project would be decreased. Using energy production estimates from downstream dams contained in the paper entitled Economic Impacts of Alternative Water Allocations in the Colorado River Basin, by J.F. Booker and R.A. Young (1991), and the marginal cost of increased capacity and energy to the regional power system as a result of the Project, the loss of power generation was estimated. Annual power generation lost was estimated at [63,000,000] kwh. The annual loss due to the decrease in power generation was estimated at [\$2,898,000] using a marginal cost of 46 mills per kwh.

Therefore, the opportunity cost associated with loss of hydropower could be approximately \$2.9 million if the current obstacles could be overcome.

o Value of Opportunity Costs Associated with Salinity Control Costs

Depletions of 57,100 afy by the ALP Project would also cause downstream damages because of increased salinity concentrations. Salinity damages are measured by the change in salinity levels of the Colorado River as measured at Imperial Dam. The estimated salt concentration effect due to the depletion of 57,100 afy is equivalent to a salt loading of 59,000 tons annually. The bulk of these damages are borne by the M&I users in the lower basin. The current costs due to the increased salinity concentration at Imperial Dam is \$50 per ton annually. Using this value, the annual salinity costs to the project would be placed at \$2.95 million (rounded to \$3.0 million) annually.

o Value of Opportunity Costs Associated with Endangered Species

The RPA contained in the 1996 Biological Opinion for the ALP Project only allowed for an average depletion of 57,100 afy. The ALP Project will be designed around this depletion figure. For example, Ridges Basin Reservoir and the pumping plant on the Animas River have been sized and modeled to ensure that the diversion off the Animas River and return flows to the San Juan River Basin would not exceed the depletion limit of 57,100 afy. Thus, mitigation for fish and wildlife impacts have been incorporated into the design of the ALP Project to the extent that there are no opportunity costs to assess.

o Value of Opportunity Costs Realized Through Avoidance of Operations and Maintenance (O&M) Costs

Expenditures on O&M include the costs of personnel, equipment, pumping power, supplies, replacement, and administration. For the ALP Project, the most significant component of the O&M costs is the power required for pumping. Under this alternative, it is likely that little or no power for pumping would be required. This power would thus, in concept, continue to provide an opportunity to be used by the public. The annual O&M cost associated with Alternative 9 is approximately \$1.6 million per year. This cost would be avoided if the ALP Project were not constructed.

o Value of Opportunity Costs Realized Through Avoidance of Administrative Costs

Because Alternative 9 does not involve the construction of structural features, lower Reclamation administrative costs would be expected. Administrative costs for other Reclamation projects in the project area were used as a guideline for an estimate of administrative costs. The present administrative costs for the following projects are:

Mancos Project	=	\$40,000 per year
Pine River Project	=	\$94,000 per year
Dolores Project	=	\$170,000 per year (this will go down after the start-up phase is completed)
Florida Project	=	\$50,000 per year

Reclamation estimates that the annual administrative costs attributable to the ALP Project would be approximately \$100,000 per year, or \$0.1 million annually.

These opportunity costs are summarized below in **Table 2-41**.

Table 2-41 Summary of Revenue Stream from Opportunity Costs	
Component	Opportunity Costs
Hydropower	\$2.9 million
Salinity	\$3.0 million
Endangered Species	0
Operation and Maintenance Costs Avoided	\$1.6 million
Administrative Costs Avoided	\$0.1 million
Total	\$7.6 million
Note: These opportunity costs would be off-set by an undetermined amount that would be required to administer a program of this nature.	

Available Water from Existing Storage Facilities

Available water from existing federal storage facilities has been discussed previously under Alternative 6. See Section 2.3.2.6.2 for a discussion on this analysis.

2.3.2.9.3 *Environmental Impacts Associated with Alternative 9*

Table 2-42 provides a summary of the environmental impacts associated with Alternative 9.

Table 2-42 Alternative 9 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	No impacts
Cultural	No impacts
Water Resources/Hydrology	No impacts
Recreation	No impacts
Socioeconomics	No impacts
Threatened/Endangered Species	No impacts
Water Quality	No impacts
Wetlands	No impacts
Wildlife/Vegetation	No impacts

2.3.2.9.4 *Evaluation of the Capability of Alternative 9 to Meet Purpose and Need Requirements of the Project*

Table 2-43 summarizes the evaluation of the capability of Alternative 9 to meet the purpose and need.

Table 2-43 Alternative 9 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Without storage, this alternative would not provide the required water yield. Therefore, it would fail the test of water yield under the capability of meeting the purpose and need for the project.
Reliability	This alternative assumes that storage facilities would exist downstream to provide the carryover storage for a firm water supply. A cursory evaluation indicates that operators and users of the waters of large reservoirs such as Lake Powell and Lake Mead contend that these waters are fully allocated.
Location	Location was not assigned any value.
Practicability	The alternative fails the test of practicability. It is not practicable to implement a program of having down-stream power users to pay an annual revenue stream for water that they are already receiving. The same is true for beneficiaries of lower salinity in the Colorado River in the lower basin states. As a fundamental matter, existing power revenues from Upper Colorado River Basin hydropower facilities are established and allocated to meet repayment obligations established by Congress in Section 5 of the Colorado River Storage Project Act of 1956. Creating a new revenue stream to compensate the Colorado Ute Tribes for not depleting the flow of the Animas and La Plata Rivers would require a rate increase that would need to be incorporated into the present cost-based power rates. At this time, support for such an increase would likely be difficult. Congress could, however, authorize appropriations to compensate the Colorado Ute Tribes for non-use of Tribal water rights. Such compensation could, in theory, be based

Table 2-43 (continued) Alternative 9 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Practicability (continued)	on the value of water for instream flow purposes (e.g., hydropower, salinity control, endangered species) and would also assist the Tribes to find alternative water supplies (acquisition). As a threshold matter, one difficulty with this option is in securing appropriations on a yearly basis. Additionally, there are other practical concerns, such as a failure of this alternative to supply any water for consumptive use by the Colorado Ute Tribes. To the extent that the revenue stream created provides a mechanism to acquire water, the potential for that and any resultant impacts are evaluated under Alternative 6. There is also difficulty in ensuring the benefits of the instream flow sought to be preserved by Alternative 9. An instream flow right would need to be secured, which would require either (a) Congressional declaration (i.e., specific declaration of the purpose of the existing federal reserved right), likely be controversial, or (b) recognition under state law, which would also be difficult given Colorado's statute which limits appropriation of instream flows to the State Water Conservation Board (see Colo. Rev. Stat 37-92-102(3)). For all the foregoing reasons, Alternative 9 fails the test of practicability. Much of this discussion also relates to feasibility, which is discussed below.

2.3.2.9.5 *Evaluation of the Technical and Economic Merits of Alternative 9*

Table 2-44 summarizes the evaluation of technical and economic factors of Alternative 9.

Table 2-44 Alternative 9 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Does not satisfy the 1988 Settlement Act for the Colorado Ute Tribes. This alternative would not impact the Jicarilla Apache Tribe and the Navajo Nation in the development of their water resources.
Feasibility	This alternative assumes revenue streams would come from downstream beneficiaries of the water that would not be depleted if the ALP Project was not constructed. The primary beneficiaries are power companies and the lower basin states that benefit from reduced salinity in the Colorado River. A revenue stream generated from loss of power revenues and salinity benefits to downstream users would most likely be compared to the next best alternative.
Development Costs	None estimated.
Operation, Maintenance, and Replacement Costs	None estimated, but there would be an administrative cost which could be significant to implement and operate this alternative to ensure that water promised would be available to downstream users.
Public Safety	Same as described under Alternative 1.
Impacts to Ongoing Operations	Same as described under Alternative 1.

While this alternative does not supply the desired annual depletion of 53,200 afy for the Colorado Ute Tribes and there are numerous obstacles to implementation, portions of Alternative 9 may have merit when combined with other alternatives.

2.3.2.10 Alternative 10 - No Action Alternative

Under this alternative, no activities would be undertaken to implement the Settlement Act, and, as a consequence, there would be no settlement under the ALP Project of the Colorado Ute Tribes' senior water rights claims. Under such a scenario, the Tribes, as outlined in the Settlement Agreement, must elect to either retain the project-reserved water right or they must commence litigation or negotiation of their pending reserved water rights claims. This determination must be made by January 31, 2005.

The Administration believes, however, that there are too many uncertainties surrounding the election to include such information in the no action analysis. Moreover, even if the Administration were able to predict which option the Tribes would elect, it is difficult to develop an analysis on the outcome of this election due to the fact that two of the three choices that would be before the Tribes at that time involve processes (negotiation and litigation) which outcomes would be impossible to predict.

Accordingly, while cognizant that the outcome of the Tribal election could have effects on the environment if the Settlement Act is not implemented, those effects are not included in the No Action Alternative.

Tribal development of natural resources or other economic development tied to water use would likely be delayed until the Colorado Ute Tribes' water claims were settled. Existing water uses would likely continue during litigation or negotiation. Conflicts could exist between the Indian and non-Indian communities in the area. Non-Indian water development would be subject to the efforts of private individuals, municipalities and industries to acquire and develop water for their use. There could be independent development of small water storage and conveyance facilities in or adjacent to the project area. However, all future non-Indian water development and use could be subject to resolution of the Colorado Ute Tribes' water rights claims and would be substantially hindered.

2.3.2.10.1 Environmental Impacts Associated with Alternative 10

Table 2-45 provides a summary of the environmental impacts associated with Alternative 10.

Table 2-45 Alternative 10 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	Refer to Chapter 3
Cultural	Refer to Chapter 3
Water Resources/Hydrology	Refer to Chapter 3
Recreation	Refer to Chapter 3
Socioeconomics	Refer to Chapter 3
Threatened/Endangered Species	Refer to Chapter 3
Water Quality	Refer to Chapter 3
Wetlands	Refer to Chapter 3
Wildlife/Vegetation	Refer to Chapter 3

2.3.2.10.2 *Evaluation of the Capability of Alternative 10 to Meet the Purpose and Need Requirements of the Project*

Table 2-46 summarizes the evaluation of the capability of Alternative 10 to meet the purpose and need.

Table 2-46 Alternative 10 Evaluation of Capability of Alternative to Meet the Purpose and Need	
Evaluation Factor	Description of Capability to Meet this Requirement
Water Yield	Any future water development in the project area would be subject to the individual efforts of the Colorado Ute Tribes, Navajo Nation, and the municipalities and industries needing water.
Reliability	The reliability of the water supply would depend on who developed the supply, the priority of water rights used, and the effect of any future water rights negotiations by the Colorado Ute Tribes.
Location	The desirability of location would depend on by whom and where the water would be developed.
Practicability	The practicability of developing the projected needed future water supplies on a piecemeal basis is low.

2.3.2.10.3 *Evaluation of the Technical and Economic Merits of Alternative 10*

Table 2-47 summarizes the evaluation of technical and economic factors of Alternative 10.

Table 2-47 Alternative 10 Summary of Results of the Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	This alternative would not satisfy the water rights claims of the Colorado Ute Tribes. The impact to the Jicarilla Apache and the Navajo would depend on by whom and how the water resources are developed in the future.
Feasibility	This alternative is feasible, however, based on projected water demands, water development would need to take place in the future.
Development Costs	There are no assigned costs to this alternative. However, not satisfying the Colorado Ute Tribes water rights claims could lead to litigation costs and costs to other entities in developing their needed water supplies.
Operation, Maintenance, and Replacement Costs	No operation and maintenance costs have been assigned to this alternative.
Public Safety	Would depend on what future action is taken to develop needed water supplies.
Impacts to Ongoing Operations	Would depend on what future action is taken to develop needed water supplies.

2.3.3 Summary of Strengths and Weakness of Each of the Alternatives

Each of the 10 alternatives are summarized in this section in terms of their overall strengths and weaknesses. Based on the strengths and weaknesses described below, Alternative 4 and Alternative 6 were determined to warrant further consideration.

2.3.3.1 Alternative 1 - Administration Proposal

Areas of Strengths

- Meets purpose and need of the project
- Satisfies Colorado Ute Tribes ITAs by providing water and other benefits commensurate with the Settlement Act
- Provides M&I water to ALPWCD, SJWC, and Navajo Nation
- Provides for a long-term assured water supply

Areas of Weakness

- Does not provide water for a conservation pool
- Loss of 121 acres of wetlands in Ridges Basin
- Loss of 1,280 acres of wildlife habitat
- Potential impact to 380 cultural resource sites
- More difficult for Jicarilla Apache Tribe and the Navajo Nation to develop water rights on the San Juan River
- Does not provide sufficient water to meet flow requirements pursuant to the ESA

2.3.3.2 Alternative 2 - Administration Proposal with Recreation Element Added

Areas of Strengths

- Meets the purpose and need of the project
- Satisfies Colorado Ute Tribes ITAs by providing water and other benefits commensurate with the Settlement Act
- Provides a reservoir conservation pool; recreation potential
- Provides M&I water to ALPWCD, SJWC, and Navajo Nation
- Provides for a long-term assured water supply

Areas of Weakness

- Does not provide sufficient water to meet flow recommendations in the San Juan River Basin pursuant to the ESA
- Loss of 120 acres of wetlands in Ridges Basin
- Loss of 1,490 acres of wildlife habitat
- Potential impacts to 380 cultural resource sites
- More difficult for Jicarilla Apache Tribe and the Navajo Nation to develop water rights on the San Juan River

**2.3.3.3 Alternative 3 - Administration Proposal with San Juan River Basin
Recovery Implementation Program Element Added**

Areas of Strengths

- Meets the purpose and need of the project
- Satisfies Colorado Ute Tribes ITAs by providing water and other benefits commensurate with the Settlement Act
- Provides sufficient water to meet flow recommendations in the San Juan River Basin pursuant to the ESA
- Provides water to ALPWCD, SJWC, and Navajo Nation
- Provides for a long-term assured water supply

Areas of Weakness

- Does not provide for a conservation pool
- Loss of 121 acres of wetlands at Ridges Basin
- Loss of 1,370 acres of wildlife habitat
- Potential impacts to 380 cultural resource sites
- More difficult for Jicarilla Apache Tribe and the Navajo Nation to develop water rights on the San Juan River

**2.3.3.4 Alternative 4 - Administration Proposal with San Juan River Basin
Recovery Implementation Program and Recreation Element Added**

Areas of Strengths

- Meets the purpose and need of the project
- Satisfies Colorado Ute Tribes ITAs by providing water and other benefits commensurate with the Settlement Act
- Provides for a conservation pool in Ridges Basin; recreation potential
- Provides sufficient water to meet flow recommendations in the San Juan River Basin pursuant to the ESA
- Provides M&I water for the ALPWCD, SJWC, and Navajo Nation
- Provides for a long-term assured water supply
- Allows for some development of water by Jicarillo Apache Tribe and the Navajo Nation on the San Juan River

Areas of Weakness

- Loss of 134 acres of wetland habitat
- Loss of 1,570 of wildlife habitat in Ridges Basin
- Potential impact to 430 cultural resource sites

2.3.3.5 Alternative 5 - Animas-La Plata Reconciliation Plan

Areas of Strengths

- Would meet the water needs of the ALPWCD, SJWC, and Navajo Nation
- Plan is acceptable to the Colorado Ute Tribes as a final settlement of their water rights claims
- Eliminates water quality concerns according to the New Mexico Department of Environment

Areas of Weakness

- Loss of 121 acres of wetlands in Ridges Basin
- Loss of 2,190 acres of wildlife habitat
- Potential impacts to 200 cultural resource sites
- Conservation pool

2.3.3.6 Alternative 6 - Animas River Citizens Coalition Conceptual Alternative

Areas of Strengths

- Leaving water on the land for farming would result in minimal damage to the environment
- Has potential if modified in an attempt to meet the purpose and need for the project
- Has potential if the significant loss of wetlands could be avoided

Areas of Weakness

- Has a fatal flaw in that it does not truly meet purpose and need of the project because it does not supply water to ALPWCD, SJWC, and Navajo Nation
- Satisfying the water yield for the Colorado Ute Tribes is uncertain due to the difficulty in implementing a water rights purchase program
- Likelihood of opposition from local farming community
- Component of leaving water on the land was not defined by the Colorado Ute Tribes as a potential future water use
- Purchase of land and water rights and removing water from the land for M&I use could result in loss of several thousand acres of wetland habitat
- Water conservation component of irrigation systems improvement would also result in large losses of wetland habitat
- Allows for no future development of water by the Jicarilla Apache Tribe and the Navajo Nation from the San Juan River

**2.3.3.7 Alternative 7 - 1996 Final Supplement to the Final Environmental Statement
Recommended Action**

Areas of Strengths

- Meets the purpose and need of the project
- Provides M&I water to rural areas in Colorado (i.e., La Plata River areas)
- Irrigation water would be provided to the Colorado Ute Tribes as per the Settlement Agreement and the Settlement Act
- Construction of two reservoirs would provide water storage and a conservation pool (Ridges Basin and Southern Ute Reservoirs)

Areas of Weakness

- Loss of 435 acres of wetlands in Ridges Basin and from canal abandonment
- Total water depletion of 149,220 afy which is in excess of 57,100 afy depletion
- Constructed in two phases (A and B)
- Loss of 2,270 acres of elk habitat
- Potential impacts to 1,600 cultural resource sites
- Water quality problems associated with irrigation practices and return flows
- Does not provide sufficient water to meet the flow recommendations in the San Juan River Basin pursuant to the ESA

**2.3.3.8 Alternative 8 - Administration Proposal with an Alternative Water Supply
for Non-Colorado Ute Indian Entities**

Areas of Strengths

- Satisfies the Colorado Ute Tribes ITAs by providing water and other benefits commensurate with the Settlement Act

Areas of Weakness

- Cost of constructing two dams would be more expensive than a single dam at Ridges Basin
- Existing gas wells within boundaries of the proposed Aztec Reservoir would present significant problems
- Geologic concerns related to the potential of falling rim rock within the Aztec Reservoir Basin
- Purchase of land and water rights to satisfy the non-structural component would require the purchase of 55 percent of the non-Indian irrigated lands in the Animas/San Juan River Basin in New Mexico

2.3.3.9 Alternative 9 - Citizens Progressive Alliance Alternative

Areas of Strengths

- Has some merit if some components of Alternative 9 are combined with other alternatives

Areas of Weakness

- Has a fatal flaw in that it does not meet the purpose and need of the project and to supply water to ALPWCD, SJWC, and Navajo Nation
- There is also difficulty in ensuring benefits of the instream flow that would be preserved by Alternative 9
- There is a practicability problem associated with implementation of Alternative 9

2.3.3.10 Alternative 10 - No Action Alternative

Areas of Strengths

- No cost would be incurred by the federal government with the exception of costs involved in possible litigation and settlement of the two Colorado Ute Tribes water rights claims
- In the short-term, would not impact development in the San Juan Basin by the Jicarilla Apache Tribe and the Navajo Nation
- In the short-term, would not affect any existing wetlands

Areas of Weakness

- Has a fatal flaw in that it does not meet the purpose and need of the project
- Would not supply water to satisfy the projected water needs of the ALPWCD, SJWC, and Navajo Nation
- Water development in the future could take place on a piecemeal, inefficient basis

2.3.4 Summary of Alternatives Evaluation and Selection of Alternatives for Further Refinement and Study

An evaluation of the alternatives for potential environmental impacts, fulfillment of project purpose and need, and relative technical and economic merits is summarized in the three tables in this section. In addition two alternatives - Alternative 4 and Alternative 6 - are selected for further refinement and study. A list of the refinements to Alternatives 4 and 6 are described at the end of the section (see Section 2.3.4.4.1).

2.3.4.1 Environmental Impact Summary

A comparison was made of the alternatives and their potential environmental impacts. (see **Table 2-48**). Implementation of Alternative 6, wherein water rights would be purchased and the water would be left on the land would present the least overall impact of the 10 alternatives. Alternative 9 was the next most environmentally desirable alternative, followed by Alternatives 5, 4, 3, and 8. Alternatives 1 and 2 would not meet the flow recommendations of the SJRBRIP and would present significant environmental impacts. Alternative 7 had significant water quality and socioeconomic impacts.

2.3.4.2 Purpose and Need Summary

A matrix of relative values was used as the basis for evaluating the likely ability of each alternative to satisfy the elements of an Indian water rights settlement for the Colorado Ute Tribes and, therefore, meet the purpose and need. **Table 2-49** contains the summary results of evaluating each of the alternatives against requirements of satisfying the elements of an Indian water rights settlement. In this process, potential combinations of structural and non-structural components were made which identified refinements to the alternatives as originally proposed. Although Alternative 6 presented significant problems from its ability to meet all the elements of an Indian water rights settlement, it has been refined in order to provide this alternative the best possible chance of meeting these elements. Alternative 4 was the other alternative chosen to be refined in light of ESA and CWA concerns. These two alternatives are subjected to more rigorous scrutiny of their potential environmental impacts in Chapter 3, Affected Environment and Environmental Consequences.

Water Yield

Alternatives were evaluated on their ability to provide an assured water supply. Alternative 6 and Alternative 9 rated low for the yield factor, while Alternatives 1, 2, 3, and 4 rated equally as the highest. The problem of water yield with Alternative 6 relates to lack of ability to develop a firm yield each year. Alternative 6 was refined to improve its rating in meeting the desired water yield. Alternative 8 was rated moderate in meeting the desired water yield while Alternatives 5 and 7 were rated as low to moderate in terms of meeting water yield. Alternatives 9 and 10 were rated low because they do not provide any water.

Reliability

Alternative 9 rated the lowest for reliability, followed closely by Alternative 6. Alternatives 1, 2, 3 and 4 rated equally as the highest. Alternative 8 garnered a medium reliability rating, while Alternatives 5 and 7 were rated as low to moderate in terms of reliability. Again, the inability of some components of Alternative 6 to provide a firm water supply on a renewable basis led to its low rating for reliability. Alternative 6 was later refined to improve its reliability rating. Alternative 10, the No Action Alternative was rated as not being reliable.

<p align="center">Table 2-48 Summary of Significant Environmental Impacts of the Alternatives</p>		
Alternative	Summary of the More Significant Impact Areas	Overall Environmental Rating of Alternative
Alternative 1 Administration Proposal	Would impact meeting the flow recommendations of the SJRB RIP. Approximately 134 acres of wetland loss in Ridges Basin. Potential for slight negative impact on rafting and fishing on the Animas River. Potential to affect 380 cultural resources sites. The size of Ridges Basin would only support a put and take fishery (no conservation pool). Water quality in the Animas River would be degraded by 2% to 4% over historical values. About 1,280 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	No significant environmental obstacles except not being able to meet flow recommendations of the SJRB RIP, which is significant.
Alternative 2 Administration Proposal With Recreation Element Added	Would impact meeting the flow recommendations of the SJRB RIP. Approximately 134 acres of wetland loss in Ridges Basin. Potential for slight negative impact on recreational rafting and fishing on the Animas River. Potential to affect approximately 380 cultural resource sites. A conservation pool would be provided for in Ridges Basin Reservoir to help maintain reservoir water quality and provide capacity for a cold water fishery that could be established. About 1,490 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	Same as above for Alternative 1.
Alternative 3 Administration Proposal With SJRB RIP Element Added	Would not impact meeting the flow recommendations of the SJRB RIP. Approximately 134 acres of wetland loss in Ridges Basin. Potential for slight negative impact on recreational rafting and fishing on the Animas River. Potential to affect approximately 380 cultural resource sites. The size of Ridges Basin Reservoir would only support a put and take fishery (no conservation pool). About 1,370 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	Environmentally superior to Alternatives 1 and 2. Meets the SJRB RIP flow recommendations. No significant environmental flaws.
Alternative 4 Administration Proposal with SJRB RIP and Recreation Element Added	Would not impact meeting flow recommendations of the SJRB RIP. Positive effect of recreational opportunities at Ridges Basin. Approximately 134 acres of wetland loss in Ridges Basin. Potential for slight negative impact on recreational rafting and fishing on the Animas River. Potential to affect approximately 430 cultural resource sites. Ridges Basin Reservoir would be large enough to support a trout reproductive fishery, and conservation pool will help maintain reservoir water quality. About 1,570 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	Environmentally superior to Alternatives 1, 2, and 3. Meets the SJRB RIP flow recommendations. No significant environmental flaws.
Alternative 5 Animas-La Plata Reconciliation Plan	Would not impact meeting flow recommendations of SJRB RIP. Reservoir also large enough for a recreational component. Loss of 134 acres of wetland in Ridges Basin. About 200 cultural resources sites would be affected. Pumping may have a slight negative impact on recreational rafting and fishing on the Animas River. Ridges Basin Reservoir would provide for boating and fishing opportunities on the Reservoir. About 2,190 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	No significant environmental flaws but more impactful than Alternatives 1, 2, 3, and 4.

<p align="center">Table 2-48 (continued) Summary of Significant Environmental Impacts of the Alternatives</p>		
Alternative	Summary of the More Significant Impact Areas	Overall Environmental Rating of Alternative
Alternative 6 Animas River Citizens Coalition Conceptual Alternative	There are several components to this alternative. The component of purchasing land and water rights and leaving the water on the land is the least environmentally damaging of the components. The component of purchasing the water and transferring the use of the water to M&I use would result in a loss of 1,400 acres of wetlands. The most environmentally damaging component is implementing water conservation measures through converting from flood to sprinkler systems. An estimate of 6,000 to 8,000 acres of wetlands would be lost through this component. Would not impact meeting flow recommendations of the SJRB RIP.	If the land and water rights are purchased and the water is left on the land, this alternative is the most environmentally preferred. If the water is removed from the land, or water is obtained through conservation measures, this alternative is the least environmentally preferred.
Alternative 7 1996 FSFES Recommended Action	There were significant water quality concerns and socioeconomic issues as described in the 1996 FSFES. Phase I, Stage A would cause little impact to the recreation and water quality in the Animas River. Phase I, Stage B and Phase II would cause a more significant impact to recreation and water quality on and in the Animas River. Also, irrigation return flows would have a negative impact on water quality. About 3,500 cultural resources sites could be affected. Phase I, Stage A would meet flow recommendations but Phase I, Stage B and Phase II would impact meeting flow recommendations of the SJRB RIP. Approximately 2,190 acres of potential wildlife habitat would be inundated by Ridges Basin Reservoir.	Received a low environmental rating because of water quality concerns. Also, not as attractive as other alternatives in meeting the flow recommendations of the SJRB RIP.
Alternative 8 Administration Proposal with an Alternative Water Supply for Non-Colorado Ute Indian Entities	Would impact meeting the flow recommendations of the SJRB RIP. Approximately 134 acres of wetland loss in Ridges Basin. Potential for slight negative impact on rafting and fishing on the Animas River. There are water quality issues associated with a smaller reservoir at Ridges Basin. Potential to affect 380 cultural resources sites in Ridges Basin and additional sites in the Aztec Reservoir site. The loss of wildlife habitat would be similar to Alternatives 1 and 3.	Not as desirable as other alternatives with Ridges Basin because of poorer water quality. Would have the impacts associated with building two reservoirs.
Alternative 9 Citizens Progressive Alliance Alternative	There appears to be little impact to the environment and the impacts with the other alternatives would be avoided if this alternative was implemented.	Next to Alternative 6, using the option where water is bought and left on the land, this alternative is the next most environmentally preferred alternative.
Alternative 10 No Action Alternative	There would be no immediate change in the environment over present day conditions. Legal actions that may be taken by the Colorado Ute Tribes could result in significant issues.	(No rating)

<p align="center">Table 2-49 Summary of the Capability of Alternatives to Meet the Purpose and Need Requirements</p>					
Alternative	Purpose and Need Requirement Areas				Overall Summary of Purpose and Need
	Water Yield^a	Reliability	Location	Practicability	
Alternative 1 Administration Proposal	Provides desired yield of 57,100 afy depletion for structural component and approximately 13,000 afy depletion from the non-structural component.	Water supplies are renewed through the hydrologic cycle.	Ridges Basin is located in close proximity to many M&I needs. Some needs are located further than desired. Would receive a moderate to high rating for location.	It is practicable to construct Ridges Basin Dam. Alternative would impact meeting flow recommendations for the SJRBRIP which would result in a low rating for practicability.	Alternative 1 is acceptable in that it meets the purpose and needs requirement although it does impact meeting the flow recommendations for the SJRBRIP.
Alternative 2 Administration Proposal With Recreation Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.
Alternative 3 Administration Proposal With SJRBRIP Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	It is practicable to construct Ridges Basin Dam. Does not impact meeting flow recommendations for the SJRBRIP, which would result in a high rating for practicability for Alternative 3.	Alternative 3 is acceptable in that it meets the purpose and need requirements. It is favored over Alternatives 1 and 2 in that it meets the requirements for endangered fish in the San Juan River.
Alternative 4 Administration Proposal with SJRBRIP and Recreation Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 3.	Alternative 4 is acceptable in that it meets the purpose and need requirements. It is favored over Alternative 3 in that it meets the requirements for endangered fish in the San Juan River and has a conservation pool.
Alternative 5 Animas-La Plata Reconciliation Plan	Does not supply all the water to satisfy 62,200 afy diversions (or 53,200 afy of depletion) to Colorado Ute Tribes, therefore it does not pass the test for water yield.	Same as described under Alternative 1.	Same as described under Alternative 1.	It is practicable to construct Ridges Basin Dam. The plan can be implemented but it does not satisfy the 1988 Settlement Act.	Rated low because it does not provide the required water supply under the Settlement Act.
^a In addition to the 57,100 afy of depletion associated with the structural components of Alternatives 1, 2, 3, 4, and 8, the Colorado Ute Tribes are entitled to an additional 13,000 afy of depletion under the Settlement Agreement. This additional depletion could come from the acquisition of existing water rights through the purchase of irrigated agricultural lands and would follow an historic depletion pattern that would not result in a total ALP Project depletion above the 57,100 afy.					

<p align="center">Table 2-49 (continued) Summary of the Capability of Alternatives to Meet the Purpose and Need Requirements</p>					
Alternative	Purpose and Need Requirement Areas				Overall Summary of Purpose and Need
	Water Yield	Reliability	Location	Practicability	
Alternative 6 Animas River Citizens Coalition Conceptual Alternative	The purchase of lands and water and leaving the water on the land or using it for M&I purposes meets the desired water yield of 62,200 afy diversion (or 53,200 afy depletion) for the Colorado Ute Tribes. The use of water from federal facilities does not supply the required water yield. Does not provide water for non-Colorado Ute Tribe entities and would rate low in terms of water yield.	The water supply would be renewed on an annual basis for either farming or for M&I purposes. Does not provide water on a renewable basis for non-Colorado Ute Tribe entities. The use of water from federal facilities does not provide for a renewed water supply each year.	Would rate high in location because the water sources are located closer to the potential M&I use areas.	Alternative 6 would rate low in practicability because of the need to purchase approximately 27% of the total non-Indian irrigated lands in the project area. Also, if the land is purchased and water moved off the land and used for M&I purposes, the amount of wetland mitigation would make this alternative impracticable.	Alternative 6 was rated as low to moderate because of the lack of practicability and acceptability of purchasing water rights for lands in excess of 43,000 acres, which represents about 27% of the non-Indian irrigated lands in La Plata and Montezuma Counties. The availability of water from federal project received a very low rating. Also, does not provide water for non-Colorado Ute Tribe entities as required under the purpose and need of the project. The practicability of mitigating for the loss of a large amount of wetlands is also questionable.
Alternative 7 1996 FSFES Recommended Action	Phase I only provides 32,500 afy for the Colorado Ute Tribes which is considerably less than the diversion of 62,200 afy required under the Settlement Act. Phase II, combined with Phase I, would provide the required water under the Settlement Act.	Same as described under Alternative 1.	Ridges Basin Dam and other associated facilities are located in close proximity to the needs of the Colorado Ute Tribes.	Alternative 7 is practicable in that the project could be implemented and meets the Settlement Act total water needs, if irrigation were an acceptable component. Alternative would impact meeting flow recommendations for the SJRBRIP which would result in a low practicability rating.	Alternative 7 does not strictly meet the purpose and need in that it has an agricultural component. It received a low rating in terms of meeting the purpose and need factors.

Table 2-49 (continued)
Summary of the Capability of Alternatives to Meet the Purpose and Need Requirements

Alternative	Purpose and Need Requirement Areas				Overall Summary of Purpose and Need
	Water Yield	Reliability	Location	Practicability	
Alternative 8 Administration Proposal with an Alternative Water Supply for Non-Colorado Ute Indian Entities	Same as described under Alternative 1.	Same as described under Alternative 1.	Ridges Basin and the Aztec Reservoir site are located in close proximity to many M&I needs. Some needs are located further than desired. Alternative would receive a moderate to high rating for location.	The structural components of Alternative 8 are practicable. The non-structural component of purchasing existing water rights and agricultural lands in New Mexico is not practical from cost and acceptability standpoints.	Alternative 8 was rated as being able to meet the purpose and need, but is not as desirable as Alternative 4.
Alternative 9 Citizens Progressive Alliance Alternative	Does not provide the desired water yield. It is based on revenue streams from opportunity costs.	Does not have a means to ensure that the water supply would be available on a renewable basis. To carry out this alternative, there would need to be storage provided.	Alternative does not provide for water in the locations where the Colorado Ute Tribes have identified their water needs. It does, however, provide that monies from the revenue streams could be used to construct facilities to serve these areas.	Alternative 9 is not practicable in that it would be difficult to implement. It assumes that storage would be available somewhere on the Colorado River, system such as at Glen Canyon.	Overall, Alternative 9 does not meet the purpose and need. It does not provide for the required water supply for the Settlement Act.
Alternative 10 No Action Alternative	Does not provide any water and, therefore, does not pass the test of water yield.	Does not provide water on a renewable basis.	No rating on location.	Litigation could occur if this course were pursued.	No Action does not meet the purpose and need of the project.

Location

Alternative 6 received the highest rating for the location factor in recognition that the opportunity existed in Alternative 6 for the Colorado Ute Tribes to purchase water from lands near their identified areas of need. Alternatives 1, 2, 3, and 4 rate low for this factor since the water would be supplied from a reservoir at Ridges Basin, and some of the Tribal non-binding water uses are located a considerable distance from Ridges Basin. Alternative 8 received a low to medium rating for location. Alternatives 5 and 7 received a low rating for location because they were designed to supply irrigation water instead of the now solely M&I project. Alternative 9 did not provide water and was rated low in terms of location. Alternative 10, the No Action Alternative, was rated as low since it does not provide for any facilities to meet the M&I needs.

Practicability

Alternatives 1 and 2 received low ratings for practicability because they did not meet the flow recommendations. Alternatives 6 and 8 received medium rating for this factor. Alternative 3 and 4 received the highest ratings for practicability. Implementing Alternatives 5 and 7 (Phase 1) would not result in a sufficient yield of wet water to meet the Settlement Act. Alternative 9, the Citizens Progressive Alliance Alternative, contained problems in the practicability of achieving Indian water needs from the proposed approach of opportunity cost revenue streams. Alternative 10, the No Action Alternative, did not meet the basic purpose and need requirements.

2.3.4.3 Technical and Economic Summary

Table 2-50 contains a summary of the technical and economic evaluation of each alternative. The potential impacts to ITAs ranged from significantly negative through no impacts to overall positive impacts. Alternatives 9 and 10 were rated the lowest because neither would provide water to satisfy the Colorado Ute Tribal water rights claims, and therefore would not satisfy the ITA s for the Colorado Ute Tribes. Alternative 6 would result in positive economic impacts from the acquisition of lands and water by the Colorado Ute Tribes, while Alternatives 1, 2, 3, 4, 5, 7, and 8 would result in negative impacts from construction. There were no significant differences between Alternatives 1, 2, 3, 4, 5, 7, and 8 for feasibility. For impacts to ongoing operations, Alternatives 1, 2, 3, 4, 5, 7 and 8 would have only minor impacts. Development costs ranged from \$216 million (Alternative 1) to \$368 million (Alternative 8). Operation, maintenance and replacement costs were nearly equal for Alternatives 1, 2, 3, 4, 5 and 8, at approximately \$1.6 million per year. Alternative 7 was the highest for operation and maintenance at \$3,785,000. Impacts to public safety ranged from negative (Alternatives 1, 2, 3, 4, and 8) to positive (Alternative 6) based on the relative potential for dam failure.

Overall, from a technical and economic perspective, Alternatives 1, 3 and 6 ranked the best followed next by Alternatives 2 and 4. Alternatives 5, 7 and 8 followed with moderate ratings. Alternatives 9 and 10 were ranked as the least desirable.

2.3.4.4 Selection of Alternatives for Further Study

Based on the strengths and weaknesses of the alternatives described in Section 2.3.3 and the analysis of alternatives based on environmental impacts, purpose and need, and technical and economic factors in this section, Alternative 4 and Alternative 6 were determined to warrant further refinement. These two alternatives, as well as Alternative 10, the No Action Alternative, are discussed in the remaining sections and chapters of this DSEIS. Before completing additional studies on Alternative 4 and Alternative 6, refinements to both alternatives were made. The important components of these refinements are described below.

Table 2-50
Summary of Technical and Economic Factors

Alternative	Technical and Economic Areas						Overall Evaluation
	Indian Trust Assets	Feasibility	Development Costs	Annual O&M and Replacement Costs	Public Safety	Impacts to Ongoing Operations	
Alternative 1 Administration Proposal	Satisfies water claims as quantified in the Settlement Act. Development would make it more difficult for Jicarilla Apache Tribe and Navajo Nation to develop more water from the San Juan River.	It is technically feasible to construct Ridges Basin. Dam.	\$217 million	\$1.6 million	A safe dam at Ridges Basin could be constructed.	Flow recommendations for endangered fish could be met.	Satisfies the technical and economic factors.
Alternative 2 Administration Proposal with Recreation Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	\$239 million	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.
Alternative 3 Administration Proposal with SJRBRIP Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	\$224 million	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 1.	Satisfies the technical and economic factors. Because of ESA, it is more attractive than Alternatives 1 and 2.
Alternative 4 Administration Proposal with SJRBRIP and Recreation Element Added	Same as described under Alternative 1.	Same as described under Alternative 1.	\$247 million	\$1.5 million	Same as described under Alternative 1.	Same as described under Alternative 1.	Same as described under Alternative 3.
Alternative 5 Animas-La Plata Reconciliation Plan	Colorado Ute Tribes agreed to settle for the amount of water identified in this alternative.	Same as described under Alternative 1.	\$238 million	Same as described under Alternative 1.	Same as described under Alternative 1.	There would be no impacts to ongoing operations.	Does satisfy Colorado Ute Tribes ITAs.

Table 2-50 (continued)
Summary of Technical and Economic Factors

Alternative	Technical and Economic Areas						Overall Evaluation
	Indian Trust Assets	Feasibility	Development Costs	Annual O&M and Replacement Costs	Public Safety	Impacts to Ongoing Operations	
Alternative 6 Animas River Citizens Coalition Conceptual Alternative	The purchase of land and water rights and transferring to M&I users would meet ITAs. The purchase of land and water rights and leaving water on the land for agricultural use would not meet the ITAs since the purpose and need is for M&I water. The component of obtaining water from use of existing facilities would not provide the required water to satisfy ITAs. Under this latter component, only 20,000 afy of water would be available.. Uncertainties as to whether sufficient benefits with sufficient certainty are provided to justify Tribes waiving their claims.	The feasibility of purchasing in excess of 43,000 acres of land is feasible but receives a low rating in feasibility because of the difficulty in implementation and acceptability by the Colorado Ute Tribes and non-Indian farmers.	<p>Scenario 1 - Purchase water rights and farm</p> <p>Cost=\$220 million</p> <p>Scenario 2 - Purchase water rights and transfer to M&I use</p> <p>Water rights/lands = \$260 million Required storage= \$80 million Total cost = \$340 million</p> <p>Scenario 3 - Use of water from federal facilities</p> <p>Improve irrigation systems: Cost=\$392 million Raise Lemon Dam Cost=\$28 million Total=\$430 million</p>	<p>Scenario 1 - O&M = \$64,500/year</p> <p>Scenario 2 - Costs are dependent on location, type of facilities, and water use.</p> <p>Scenario 3 - O&M = \$87,500/year</p> <p>Replacement for sprinklers = \$1.4 million per year when annualized over 50 years</p>	<p>Scenario 1 - No impact on public safety.</p> <p>Scenario 2 - Overall, no to low impact with the construction of new storage facilities.</p> <p>Scenario 3 - Enlarging Lemon Dam would provide a positive increase in safety.</p>	<p>Would have impacts to the agricultural economy in La Plata and Montezuma Counties.</p> <p>A significant number of non-Indian farmers would be displaced through the purchase of more than 43,000 acres of existing non- Indian farms.</p> <p>Would have potential negative effect to endangered southwestern willow flycatcher</p>	Overall, this alternative received a low to moderate rating based on technical and economic factors. Among the reasons for this rating is the practicability and acceptability of purchasing 27% of the non-Indian irrigated lands in La Plata and Montezuma Counties.
Alternative 7 1996 FSFES Recommended Action	Together, Stage A and B of Phase I would meet ITAs.	Is feasible in that the project could be constructed.	\$246 million	\$3.8 million	Same as described under Alternative 1.	Same as described under Alternative 5.	Same as described under Alternative 1.

Table 2-50 (continued)
Summary of Technical and Economic Factors

Alternative	Technical and Economic Areas						Overall Evaluation
	Indian Trust Assets	Feasibility	Development Costs	Annual O&M and Replacement Costs	Public Safety	Impacts to Ongoing Operations	
Alternative 8 Administration Proposal With an Alternative Water Supply for Non- Colorado Ute Indian Entities	Satisfies ITAs by providing required M&I water.	Ridges Basin and Aztec Reservoirs are feasible to construct. Implementing a water rights purchase program in New Mexico would be expensive and difficult to carry out.	Ridges Basin = \$154 million To Ridges Basin would be added the cost of one of the following options: (1) Aztec Reservoir = \$84 million or (2) Purchase water rights and land = \$206 million	Approximately \$1.6 million with either option of Aztec Reservoir or purchasing water rights.	There would be no impacts to public safety.	Same as described under Alternative 5.	Overall, it meets the criteria under technical and economic factors.
Alternative 9 Citizens Progressive Alliance Alternative	Does not satisfy ITAs because it would not provide the required M&I water.	The idea of "opportunity costs" would be very difficult to implement.	There would be no cost involved with this alternative.	Not computed .	Same as described under Alternative 1.	Same as described under Alternative 5.	Would not satisfy ITAs and rates low according to feasibility and practicability.
Alternative 10 No Action Alternative	Same as described under Alternative 9.	It is not practicable to follow a course of no action.	The cost of following a course of no action cannot be quantified, but the costs could be significant.	There would be no OM&R costs associated with no action	Same as described under Alternative 1.	If the Tribes followed a course of litigation, it could have serious impacts on the water rights in southwest Colorado.	No action is not a desirable course to follow. It does not satisfy the ITAs and costs to ongoing operations could be significant.

2.3.4.4.1 Refinements to Alternative 4 and Alternative 6

- NNMP was added as a component to both refined alternatives. A discussion on alternatives for the NNMP are discussed under Refined Alternative 4.
- For Refined Alternative 4, the amount of funds available to purchase 13,000 afy of water rights would be limited to \$40 million dollars. This is the cost for the purchase of 13,000 afy if it could be accomplished in one year. Lands purchased over time would likely result in a higher cost.
- In Refined Alternative 4 and Refined Alternative 6, the water rights purchased for the 13,000 afy would be left on the land for continual agricultural use. Leaving water on the land in Refined Alternative 4 and Refined Alternative 6 would result in virtually no environmental impacts.
- For the portion of Alternative 6 which requires that water be removed from the land to meet M&I purposes, it was assumed that a plan could be developed that would avoid impacts to the environment. It was assumed that 50 percent of the potential loss of wetlands could be avoided in this manner.
- Refined Alternative 6 would be designed to make it commensurate to Refined Alternative 4 in terms of meeting the purpose and need of the project. One component of Refined Alternative 6 would be similar to the structural component of Refined Alternative 4 in terms of developing a water supply with a depletion of up to 57,100 afy. A second component of Refined Alternative 6 would purchase lands and water rights to yield approximately 13,000 afy of depletions.
- To minimize the purchase of lands, efforts are made to evaluate the potential for the coordinated operation of reservoirs and streamflows in the project area to make more efficient use of water supplies.

A detailed description of Refined Alternative 4 and Refined Alternative 6 is contained in Section 2.5.

2.4 COMPONENTS OF THE ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION IN THIS DSEIS

This section discusses the components of the structural and non-structural alternatives that have been eliminated from further consideration and analysis in this DSEIS. Also included is a discussion of several other issues that have been eliminated from further analysis in this document, such as the raising of dams.

2.4.1 Non-Structural Components Eliminated As Part of Alternatives 1, 2, 3, 4, 6, 8 and 9

The elements eliminated as part of the non-structural components of Alternatives 1, 2, 3, 4, 6, 8, and 9 are described below. These elements include: (1) water conservation through improvement of irrigation systems, (2) the raising of federal dams such as Vallecito and McPhee, (3) the presumption there is

unused water available in existing federal reservoirs, principally McPhee Reservoir, and (4) other gravity flow dam sites as options to Ridges Basin.

2.4.1.1 Water Conservation Through Irrigation System Improvement

Water conservation through irrigation system improvement was considered for the Pine, Florida, and Dolores Rivers. This option was eliminated from further consideration for the following reasons:

- The firm yield from this option would be zero unless irrigators were willing to accept a 50 percent shortage in dry years which would then provide a firm yield of 19,800 afy. This is considerably short of the required diversion of 62,200 afy (53,200 afy depletion) for the Colorado Ute Tribes.
- The cost of this component is approximately 50 percent higher than Refined Alternative 4 and would only supply from zero to one-third of the required water under the 1988 Settlement Act.
- There would be approximately 8,000 acres of wetlands in the Pine River system alone which would require mitigation.

2.4.1.2 Raising of Vallecito and McPhee Dams

The raising of the federal dams at Vallecito and McPhee was considered but eliminated for the following reasons.

- The raising of Vallecito Dam would create high social and economical impacts as a result of inundating the community and recreation surrounding the lake.
- The raising of McPhee Dam would inundate the Town of Dolores and the component was therefore eliminated.

2.4.1.3 Availability of Unused Water in McPhee Reservoir

The reservoir evaluated under this option was McPhee Reservoir on the Dolores River. The following reasons are given for rejecting the opportunities which were previously thought to have merit.

- Drawing upon the inactive pool in McPhee Reservoir would reduce the volume and frequency of spills which would have an adverse effect on the recreational boating and the trout fishery below McPhee Reservoir, and also increase O&M costs.
- Sufficient water to fill McPhee Reservoir is only available 50 percent of the time, indicating that a limited volume of water would be available on an annual basis from the inactive storage.
- The 5,000 af of presently unused M&I water is under contract with the DWCD and stockholders of the district voted in 1995 to continue to pay for the unused water to preserve it for their future generations.

- o The presumption that the present day diversions from McPhee Reservoir appear to be considerably less than the capabilities of the reservoir is a result of the lack of understanding of the hydrologic design of the reservoir. There will be years when the reservoir is not drawn heavily upon, but during a critical drought period the waters of the reservoir will be depleted to the inactive pool. Therefore, there would be little to no water available for M&I use. This is particularly true when one considers the concept of firm yield.

2.4.2 Structural Components Eliminated

Other alternatives were also examined but found to be infeasible and thus eliminated from the appraisal-level analysis. This section summarizes these other alternatives and the reason for their elimination, per 40 CFR 1502.14(a).

2.4.2.1 Howardsville Dam Site

The Howardsville Dam site is located on the Animas River, two miles upstream from the town of Silverton, Colorado. A reservoir with 75,000 af of active storage and a dam 285 feet high was proposed for the site as part of the ALP Project at time of authorization in 1968. It would reduce the reservoir size and pumping requirements at Ridges Basin. For the estimated active storage requirement of 24,000 af the dam would be 185 feet high, which is relatively high for the amount of active storage retained. The reservoir would inundate historic structures in Howardsville and saturate mine tailings. Water quality data indicated high concentrations of trace metals and the probability of bio-accumulation in fish. All these factors contributed to the elimination of this dam site as a viable alternative.

2.4.2.2 Purgatory Dam Site

Located across Cascade Creek 1.5 miles above its confluence with the Animas River, the Purgatory Dam site was considered in the 1996 404(b)(1) evaluation with storage capacities of 14.5, 41.3, 113.9, and 236.6 thousand af and with inflow augmentation by pumping from the Animas River. The site failed practicability screening because of encroachment on the then-designated Weminuche Wilderness area of the San Juan National Forest. Now that the wilderness area has been enacted and the boundary described, an additional investigation of possible use as a gravity storage site to supply water was initiated. It was found that a dam and reservoir could not be constructed without violating the wilderness area boundary.

2.4.2.3 Teft Diversion Site

The Teft Diversion was part of the ALP Project at the time of authorization in 1968. A diversion dam across the Animas River just above Cascade Creek would start gravity flow along a 48-mile route of tunnels, canals, and conduits to reach lands in the La Plata River Basin. A turnout would flow into Ridges Basin. The 1996 FSFES evaluation noted concerns about reduction in river flow and the effect of the canals on wetlands and wildlife habitat and the disruption of construction on vegetation and residences. Now, with less than one-half the previous peak diversion flow of 600 cfs and the effect on the river reduced, the route was reviewed with the possibility that a conduit might replace the canals and mitigate that concern. The conduit size would be large, about 72 or 78 inches in diameter, and a major resort and residential development could complicate right-of-way acquisition. Because of the smaller

project flow requirement, the future energy saving of the Teft Diversion would also be smaller and does not appear sufficient to justify the high cost of the long route.

2.4.2.4 Bondad Dam Site

A dam at the narrowing of the Animas River valley below the community of Bondad, near the Colorado/New Mexico state line, 16 miles downstream from Durango would form a reservoir of 100,000 af with a dam height of 180 feet. New Mexico users would receive a gravity water supply, while other users would have to pump from an elevation of about 6,050 feet. The reservoir would inundate 10 miles of river, Highway 500 and CR 318, many residences, irrigated land, and gas and oil operations. All these factors contributed to the elimination of this dam site as a viable alternative.

2.4.2.5 Cedar Hill Dam Site

This dam site, located just upstream of the community of Cedar Hill, New Mexico, is 24 miles downstream of Durango. A dam 166 feet high would form a reservoir of 101,000 af. New Mexico users would receive a gravity water supply, while others would have to pump from an elevation of about 5,950 feet. The reservoir would inundate 6 miles of river, Highway 500, many residences, irrigated land, and gas pipelines. All these factors contributed to the elimination of this dam site as a viable alternative.

2.4.2.6 Aztec Dam Site

An off-stream reservoir of 20,000 af would be formed by a dam, 152 feet high, across a small tributary to the Animas River two miles downstream from Cedar Hill, New Mexico. It would serve New Mexico users and would operate along with a smaller Ridges Basin Reservoir to meet ALP Project needs. The site was investigated for possible gravity inflow by canal and conduit from an upper reach of the Animas River, but the route topography would not accommodate a canal and proved too long and too highly developed for a large diameter conduit. Since the site is readily accessible to the river and the pumping lift is only 35 percent of that required at Ridges Basin, it was appraised as a pumped storage site. Construction would require, in addition to the dam, a buttress fill along a narrow stretch of the south reservoir wall. Nine gas wells would have to be purchased and closed, pumping and separation equipment displaced, and two gas lines relocated. Two residences are in the reservoir area. A rock strata along the reservoir rim may be subject to undercutting and toppling. All these factors contributed to the elimination of this dam site as a viable alternative.

2.5 DESCRIPTION OF ALTERNATIVES SELECTED FOR FURTHER REFINEMENT

The Plan of Approach envisioned refining the design of structures and/or developing an implementation plan for water rights purchase to sufficient detail to support project authorization and funding. This level of effort provides a high confidence in cost estimates and technical viability of structural features and displays the risks associated with a water rights purchase plan.

Two alternatives that were evaluated warranted refinement due to the closeness in their overall comparison of environmental effects and because they each represent a significantly different approach in meeting the purpose and need of the ALP Project (i.e., Refined Alternative 4 is principally a structural alternative and Refined Alternative 6 is principally a non-structural alternative). As identified earlier in

this chapter, there are concerns over the ability of Alternative 6 to meet the project purpose and need. In refining Alternative 6, an attempt was made to address these concerns.

2.5.1 Refined Alternative 4

Refined Alternative 4 includes both structural and non-structural elements designed to achieve the fundamental purpose of securing the Colorado Ute Tribes an assured water supply in satisfaction of their water rights as determined by the 1986 Settlement Agreement and the 1988 Settlement Act and by providing for identified M&I water needs in the project area.

The structural component of Refined Alternative 4 would include an off-stream storage reservoir (approximately 120,000 af total capacity) with a conservation pool for recreation and water quality of approximately 30,000 af; a pumping plant with a pumping capacity of up to 280 cfs of capacity; a reservoir inlet conduit (all designed to pump and store water from the Animas River); and a pipeline designed to transport and deliver treated municipal water to several Navajo Nation communities in the corridor from Farmington to Shiprock, New Mexico area. All structural facilities would be designed to deplete no more than an average of 57,100 afy. This depletion limit is consistent with the 1996 Biological Opinion issued by the Service.

Depletion of water from the structural portion of the project would be restricted to M&I uses only and would be allocated as shown in **Table 2-51**.

Table 2-51 Structural Component Refined Alternative 4 Depletions	
Entity	Depletion (afy)
Southern Ute Tribe (M&I)	19,980
Ute Mountain Ute Tribe (M&I)	19,980
Navajo Nation (M&I)	2,340
Animas-La Plata Water Conservancy District (M&I)	2,600
San Juan Water Commission (M&I)	10,400
Allowance for reservoir evaporation	1,800
Total Depletion	57,100

Under this allocation, the Colorado Ute Tribes would still be approximately 13,000 afy short of the total quantity of depletion recognized in the Settlement Agreement. Therefore, the non-structural component of the project would establish and utilize a water acquisition fund which the Colorado Ute Tribes could use over time to acquire water rights on a willing buyer/willing seller basis in an amount sufficient to allow the Tribes to purchase approximately 13,000 afy of historical depletions in addition to the depletions available from the structural portion of the project. A one-time fund of approximately \$40 million has been established to purchase the additional rights. However, to provide flexibility in the use

of the fund, authorization would allow some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities.

2.5.1.1 Water Supply of Refined Alternative 4

2.5.1.1.1 Source and Amount of Water Supply

The primary source of the water for the structural portion of Refined Alternative 4 is the Animas River. The project water requirements would be met from the water supply after meeting all current uses, all uses that could occur without further federal action (primarily exercise of state water rights not presently being used as identified by Colorado and New Mexico), and all uses for which favorable biological opinions have been issued.

The water supply for the non-structural component would include the Pine, Florida, Animas, La Plata and Mancos Rivers. The supply would be developed from existing uses within each basin, with the associated historic shortages and depletions, so no additional water would be needed to meet the demands of the non-structural components.

Table 2-52 is a summary of the source and amount of water supply from reservoir storage or from the purchase of lands and water rights.

Table 2-52 Refined Alternative 4 Summary of Water Sources and Amounts from Storage and Purchase of Water Rights		
Source of Water	New Depletion Amount from Structural Component (afy)	Purchase of Historical Depletion Amounts (afy)
Structural Component		
Ridges Basin Reservoir and/or pumped directly from the Animas River.	57,100	
Non-Structural Component		
Purchase 2,300 acres in Pine River Basin		3,220
Purchase 2,400 acres in La Plata River Basin		2,160
Purchase 2,300 acres in Animas/Florida River Basin		3,220
Purchase 3,300 acres in Mancos River Basin		4,290
Total	57,100	13,000

2.5.1.1.2 Depletion of San Juan River Basin Water Supply

Under Refined Alternative 4, the project would be developed to provide an average annual diversion of 111,965 af of which 57,100 af would be depleted. While the Animas River is the primary supply, the

points of diversion and return flow vary depending on the proposed use. **Table 2-53** lists the various uses and the average diversion and demand. The depletions listed are the cumulative depletions of all uses. The measurement point for the depletion is the San Juan River at Four Corners, New Mexico. The annual depletion at this location would range between 8,200 and 100,500 af. Depletions at other locations in the system could be greater or less than this amount depending on the location relative to the diversion and return flow points.

Table 2-53 Water Supply by Use for the Structural Component of Refined Alternative 4				
Category	Diversion (af)	Depletion (af)	Diversion Location	Return Flow Location
Southern Ute Indian Tribe				
Florida Mesa housing	140	70	Ridges Basin	Animas at Florida Confluence
Animas River Basin Housing	140	70	Ridges Basin	Animas at Florida Confluence
La Plata River Basin Housing	140	70	Ridges Basin	La Plata at Farmington
Animas Industrial Park M&I	40	20	Ridges Basin	Animas at Florida Confluence
Ridges Basin Golf Course	796	398	Ridges Basin	Ridges Basin
Ridges Basin Resort	44	22	Ridges Basin	Ridges Basin
Coal Mine	830	415	Ridges Basin	La Plata at state line
Coal-Fired Power Plant	27,000	13,500	Ridges Basin	La Plata at state line
Livestock and Wildlife	30	15	Ridges Basin	La Plata at state line
Southern Ute Indian Tribe Total	29,160	14,580		
Ute Mountain Ute Tribe				
La Plata Housing	280	140	Ridges Basin	La Plata at state line
Mancos Canyon Golf Course	978	489	Ridges Basin	Mancos River
Mancos Canyon Resort	33	17	Ridges Basin	Mancos River
Gas-Fired Power Plant	4,600	2,300	San Juan at San Juan Power Plant Diversion	San Juan above Shiprock
Livestock and Wildlife	40	20	Ridges Basin	La Plata at state line
La Plata Basin Resort	30	15	Ridges Basin	La Plata at state line
La Plata Basin Golf Course	626	313	Ridges Basin	La Plata at state line
La Plata Basin Dude Ranch	10	5	Ridges Basin	La Plata at state line
Ute Mountain Ute Tribe Total	6,597	3,299		

Table 2-53 (continued) Water Supply by Use for the Structural Component of Refined Alternative 4				
Category	Diversion (af)	Depletion (af)	Diversion Location	Return Flow Location
Regional Water Supply				
Durango	15,338	7,669	Ridges Basin	Animas River below pump
Bloomfield and Upstream Uses	4,533	2,267	San Juan- Citizen s Ditch	San Juan River at Farmington
Farmington	28,373	14,187	Farmington M&I Diversion	San Juan River below Animas Confluence
Florida Mesa	7,016	3,508	Ridges Basin	Animas River at Florida Confluence
Red Mesa Plateau	2,105	1,052	Ridges Basin	La Plata at State Line
Kirtland, New Mexico	7,016	3,508	Farmington M&I Diversion	San Juan above Hogback
Aztec, New Mexico	4,911	2,456	Aztec M&I Diversion	Animas River at Farmington
ALPWCD Allocation	-5,200	-2,600		
SJWC Allocation	-20,800	-10,400		
Total Regional Water Supply	43,292	21,646		
Total Ute Settlement	79,050	39,525		
Other Uses				
Navajo Nation	4,680	2,340	Farmington M&I Diversion	Shiprock below Gage
ALPWCD	5,200	2,600	See Regional Water Supply	
SJWC	20,800	10,400	See Regional Water Supply	
Ridges Basin Evaporation	2,235	2,235	Ridges Basin	None
Total Other Uses	32,915	17,575		
			Range of depletions at Four Corners, New Mexico 8,200 - 100,500 afy	
Total Water Use	111,965	57,100		
Design Total	111,965	57,100	<i>Note: In addition to the 57,100 afy depletion, the Colorado Ute Tribes are entitled to another 13,000 afy of depletion under the Settlement Agreement. These additional depletions could come from the purchase of land and water rights and would follow a historical depletion pattern which would not result in any additional depletions above the 57,100 afy.</i>	
Design - Calculated Use	(0)	(0)		

Diversion points high in the system depend on direct diversions from the Animas River, augmented by supply from Ridges Basin Reservoir. Diversions lower in the system may utilize return flows and gains in the river that are surplus to baseline needs.

2.5.1.2 Operational Requirements of Refined Alternative 4

2.5.1.2.1 Project Operation

Pumping plant and dam outlet works operation would be controlled from the control room of the Durango Pumping Plant. The control room would be in communication with Reclamation's office in Durango where the operation of southwestern Colorado projects is coordinated. River flow, reservoir level, outlet flows, and upstream watershed gage data indicative of changes in river flow would be directed to an operational model. This model would advise of the best combination of pumping units to meet the reservoir and downstream demands and to comply with the river bypass requirements and downstream commitments. Equipment maintenance duties and inspection patrols of the dam and reservoir would be directed from the pumping plant. Equipment and facility repair tasks beyond the scope of periodic maintenance duties would be assigned to specialized contractors.

2.5.1.2.2 Project Power

The ALP Project is a participating project authorized under the Colorado River Storage Project (CRSP) Act. As such, the Western Area Power Administration (WAPA) would provide the electrical power needed by the ALP Project to satisfy the authorized project purposes. Part of the electric power produced by the federal hydroelectric generating facilities of the CRSP have been reserved for participating project purposes including the power requirements for the project. The estimated power requirements for reservoir filling and for future full project use are shown below. The annual cost for pumping is presented later in Table 2-62.

- Peak monthly demand; Summer: 17,500 kilowatts (kW); Winter: 8,500 kW
- Average annual energy required: 63 million kilowatthours (kWh)

2.5.1.2.3 San Juan River Basin Recovery Implementation Program

The project will be operated to meet the flow recommendations established by the SJRBRIP in support of recovery of endangered fish in the San Juan River. While Navajo Dam is the primary operational control to achieve these flow recommendations, the operation of Ridges Basin Reservoir may also affect the ability of the system to sustain the flows recommended. The specific flow recommendations are recounted in Chapter 4, Other Impact Considerations. Meeting these flow recommendations would require modification of the Durango Pumping Plant operations to meet minimum base flows and avoid impacts to the spring runoff flows that could violate the flow requirements. Plans include limiting the 280 cfs pumping capacity to 240 cfs in June and controlling pumping during the period November through February when Navajo Reservoir falls below a target level and pumping would impact the ability to meet the minimum flow in the San Juan River with minimum releases from Navajo Reservoir.

2.5.1.2.4 *Filling Period of Ridges Basin Reservoir*

Since the project demands would lag the initial filling of Ridges Basin Reservoir, the filling schedule would follow the same operating rules as normal operation. Pumping rates would follow all requirements of normal system operation to avoid impact to existing uses and to meet SJRBRIP flow recommendations. Depending on the nature of runoff during the filling period, and first filling criteria, reservoir filling is anticipated to take from one to three years.

2.5.1.3 Structural Components and Associated Features of Refined Alternative 4

Structural components (see **Map 2-5**) and associated features of Refined Alternative 4 include:

- Durango Pumping Plant and Ridges Basin Inlet Conduit
- Ridges Basin Dam and Reservoir
- Navajo Nation Municipal Pipeline
- Electrical Transmission Lines
- Ridges Basin Recreational Element by a non-federal entity
- Relocations
- Construction Program

2.5.1.3.1 *Durango Pumping Plant and Ridges Basin Inlet Conduit*

Durango Pumping Plant - The pumping plant would pump water from the Animas River and lift it through the Ridges Basin Inlet Conduit into Ridges Basin Reservoir. The pumping plant would be located on the west side of the river across from Santa Rita Park located on the south side of downtown Durango, Colorado. Access to the pumping plant would be from CR 211 immediately north of Centennial Mall. On site with the pumping plant would be the intake structure, a parking area, a surge chamber, and an electrical switchyard. The intake structure would conduct water from the river through control gates and to the fish screen, then into a covered basin that serves as a forebay for the pumping plant. The entrance to the intake structure would consist of a sloping grate 48 feet long, situated to conform to the riverbank and designed to exclude the entry of debris into the control gates. The fish screen, 80 feet back from the river, would be designed to keep fish greater than two inches long from passing, and all fish would be channeled back to the river by the velocity in a bypass pipe at the base of the screen. The intake structure would be covered except for the fish screen area that would be open to facilitate cleaning and maintenance. **Map 2-6** presents a general plan of the Durango Pumping Plant site.

The pumping plant would be placed about 160 feet back from the river and would be both lower and not as long as the structure described in the 1996 FSFES. The lower flow requirement of 280 cfs facilitates the application of single stage horizontal centrifugal pumps instead of the higher-capacity vertical spiral case pumps proposed previously. The single stage horizontal pumps are similar in silt handling capability, are more accessible for maintenance, and require less vertical space in the structure. Five pumps would provide a total of 280 cfs and four smaller pumps would handle lower flows, trim flows between the large pumps, and provide redundancy in case one of the large pumps is out of service. A bay would be provided in the plant that would allow the City of Durango to use the facility to pump water to its terminal reservoir. The rate of pumping would be governed by:

Map 2-5 Structural components of Alternative 4

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Map 2-6 Detailed Layout of Proposed Durango Pumping Plant

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- Downstream senior water rights demands on the river
- The amount of water in the river
- Minimum bypass flows
- The capacity of Durango Pumping Plant
- Design-based reservoir filling criteria

The Durango Pumping Plant would be limited to 240 cfs in June to avoid impacting endangered fish flow requirements in the San Juan River. Pumping would be further limited, when all other downstream requirements are satisfied, to allow the following bypass flows in the Animas River at the pumping plant intake: October through November - 160 cfs; December through March - 125 cfs; and April through September - 225 cfs.

Oriented with the long side parallel with the river, the pump and equipment portion of the plant would be below the finished ground surface with an interior height of 43 feet, a width of 57 feet, and a length of 250 feet. Over this portion of the plant the crane housing would extend 24 feet above the ground to facilitate loading, unloading and maintenance of the pumping units and equipment. The crane housing would be about 40 feet wide and 250 feet long. Construction would use cast in place and precast concrete. A spherical air chamber would be partially buried alongside the parking area behind the plant and away from the river. Incoming power lines and an electrical switchyard would be located to the south, between the plant and CR 211. Fill slopes between the plant and the intake structure and between the intake structure and the river would provide space to accommodate the site landscaping.

Ridges Basin Inlet Conduit - The conduit route from the Animas River up Bodo Draw to Ridges Basin was selected because it provides the lowest pumping lift between the river and the active storage pool of the 120,000 af Ridges Basin Reservoir. It is also relatively close to the river and the terrain is not unusual for pipeline construction.

The route of the conduit from the pumping plant to the reservoir is along the trace identified in the 1996 FSFES. It proceeds southerly from the pumping plant, turns southwest to cross CR 211 and the Bodo Creek flow line, continues to a point some 1,200 feet south of CR 211 then turns up Bodo Draw, south of the creek line, and crosses the crest alongside CR 211. An air vent of about 12 inches diameter would stand about 8 feet above ground just before the crest of the ridge.

Construction would include about 11,200 feet of 66-inch diameter steel pipe with a corrosion-protective coating and about 800 feet of improvements in the discharge course toward the reservoir. The conduit would be buried in a trench at a normal depth of five to eight feet below the ground and backfilled so that upon completion of construction, the terrain would be returned to natural contours. To conserve pumping lift, the cost of various depths of additional excavation across the crest at top of the draw, including tunneling, were compared with the savings in future power costs. It was found most economical to excavate up to 35 feet deep at the crest and maintain a maximum flow line elevation of 6,950 feet. The conduit would terminate on the reservoir side of the crest with a stilling structure from which the flow would continue down to the reservoir in a rock-lined open channel.

2.5.1.3.2 *Ridges Basin Dam and Reservoir*

Ridges Basin Reservoir would have the following features:

- Maximum Reservoir Capacity - 120,000 af
- Maximum Water Surface Area - 1,500 acres at elevation 6,882 feet
- Minimum Reservoir Capacity - 30,000 af
- Minimum Water Surface Area - 870 acres at elevation 6,815 feet
- Active Capacity - 90,000 af
- Inactive Capacity - 30,000 af

Ridges Basin Reservoir would be formed by the construction of Ridges Basin Dam on Basin Creek, approximately three miles upstream from its confluence with the Animas River. To retain 120,000 af and provide for flood storage, a dam with a crest elevation of 6,892 feet would be required. The dam height would be 217 feet above stream-bed. The dam site is defined by narrowing of the downstream end of Ridges Basin with a prominent sandstone ridge to the left (northeast) of Basin Creek and two sandstone and siltstone ridges about 500 feet apart to the right. The preferred dam for the 120,000 af capacity reservoir would use the prominent sandstone for the left abutment and the more upstream of the two ridges for the right abutment. This is the same alignment that was selected for the large dam described in the 1996 FSFES. With the smaller dam now proposed, the right abutment of the planned embankment would not encounter the coal bearing formation that was a concern in the 1980 FES.

The valley floor at the dam site is covered with 40 to 90 feet of alluvial deposits over shale with lesser amounts of sandstone near the abutments. The alluvial material consists of sandy clay, clayey sand, and lean clay with varying amounts of gravel. The water table reaches a maximum of about 45 feet below the ground surface upstream of the dam site and approaches ground surface near the downstream toe of the dam site.

Construction materials available are impervious clay in Borrow Area A within the reservoir area, and pervious material including boulders, cobbles, gravel and sand in Borrow Area B, a terrace two miles downstream along Basin Creek. The proposed design for Ridges Basin Dam would accommodate these formations and materials with a zoned earthfill dam containing a thick impervious core bordered by filters and drains and supported by sloping pervious shells upstream and downstream. The upstream and downstream slopes in the 90,000 af active zone would be 2:1 (horizontal to vertical) with a bench at the bottom level of active storage and below that level: 3:1 upstream and 2-1/2:1 downstream. The core would bear directly on the foundation rock and the compressible alluvium would be removed both upstream and downstream for placement of the shell of the dam. Foundation exposure for construction would require a soil-bentonite cut-off wall upstream of the upstream toe of the dam with dewatering wells. This is a different concept from that proposed for the larger dam described in the 1996 FSFES. The previous design employed a wick drain system and preloading to consolidate the upstream alluvial material rather than removing it. The current design involves a much smaller quantity of material and eliminates the two-stage construction delay of the prior design where foundation consolidation had to occur before embankment construction could proceed. Construction quantities include approximately 2.6 million cubic yards of foundation excavation and 5.6 million cubic yards of zoned fill.

A tunnel through the left abutment would serve as the reservoir outlet. The outlet works include an intake approach channel, intake structure, upstream pressurized tunnel, gate chamber with access adit, open channel flow downstream tunnel, and stilling basin and discharge channel. The main gates would

have an emergency release capacity of 1,500 cfs. Jet-flow valves would be provided to control operational releases up to 250 cfs, one for the planned releases to meet project water demands up to 130 cfs and another to meet releases associated with the future use of the Colorado Ute Tribal water. The stilling basin would be adequate to contain flows discharged during annual testing of gate and valve operation. Flanges would be provided in the gate chamber for connection of future distribution pipelines.

Basin Creek falls about 420 feet along its 3.2-mile course from the dam to the Animas River. Planned water supply from Ridges Basin Reservoir range from 25 to 130 cfs and future releases for non-binding Colorado Ute Tribal water use development could amount to an additional 120 cfs. These releases would exceed the normal rainfall runoff in Basin Creek and an increase in silt transport to the Animas River is expected until equilibrium is achieved. Alternative means of controlling silt transport were investigated, including:

- Armor the channel with rock
- Replace the streambed with a concrete-lined channel
- Install a number of check or vortex weirs
- Release flows into a conduit laid alongside of Basin Creek

Creating steps in the channel with a series of check and drop or vortex weirs was selected as the preferred means of control. It would produce an increase in silt transport initially but would stabilize with use. It would also create some wetlands. The steps would be placed about 150 feet apart throughout the 2.5 miles of creek bed that is incised into a clayey sand formation. The lower 0.7 mile of the creek has frequent natural rock controls and would accept the additional flow without significant modification.

Access for construction activities would be from CR 211 and space for construction equipment and supplies would be located in the reservoir basin. Future access for operation and maintenance would connect with CR 213, La Posta Road, and proceed along the general alignment of existing private roads to Borrow Area B, then along the northerly canyon side up Basin Creek to the dam. A roadway across the downstream slope of the dam would provide access to the dam crest at the right (southwest) abutment.

2.5.1.3.3 *Navajo Nation Municipal Pipeline*

The Navajo Nation has requested that a water conveyance pipeline (the NNMP) be included as a structural component of the ALP Project, to upgrade the service now being provided for eight Navajo Nation chapters in the Farmington - Shiprock area, and to replace the 30-year old pipeline now in place. The through the Navajo Tribal Utility Authority (NTUA) delivers water to eight Navajo Chapters: Upper Fruitland, San Juan, Nenahnezad, Hogback, Sanostee, Shiprock, Cudei, and Beclaibito.

The new pipeline would deliver 4,560 af (2,340 af of depletion) of M&I water from the ALP Project to these eight chapters. The 4,560 af of water represents growth projections and future M&I water requirements. Existing M&I water requirements are now being provided through an existing pipeline from the City of Farmington's water treatment plant. **Map 2-7** shows the alignment of the three NNMP alternatives which have been considered for the NNMP.

Alternative NNMP-1 would replace the existing pipeline with a new, larger pipeline. It would generally follow the alignment of the existing pipeline for nearly two-thirds of the route from Farmington to

Hogback, with a route deviation on the western portion from Hogback to Shiprock. Alternative NNMP-2 would make improvements to the existing pipeline from Farmington to Shiprock, but divide it into two separate sections; the western section would be supplied with water diverted from the San Juan River at Shiprock and treated through an upgraded water treatment facility there. Alternative NNMP-3 would make use of the existing NIIP system and construct a new surface water reservoir, new pipelines, and ancillary facilities to serve the eight Navajo Nation chapters. The following sections describe the three alternatives.

Alternative NNMP-1

Alternative NNMP-1 would involve construction of a replacement pipeline generally along the alignment of the existing system that conveys municipal water to several Navajo Nation chapters around Shiprock and Farmington. The replacement pipeline would begin at the western boundary of the City of Farmington on the north side of San Juan River and terminate at the Cortez storage tanks in Shiprock. In addition, additional M&I water storage facilities would be required at Shiprock and Nenahnezad. The existing Shiprock water treatment plant and associated Shiprock intake structure would be closed. A new pumping plant would be constructed, and two existing pumping plants would be closed.

The pipeline would consist of 28.6 miles of 24-inch, 20-inch, and 16-inch diameters, to replace the existing 14-inch to 18-inch ductile iron pipeline that has been in place since 1969. The existing line has had a fairly consistent record of leaks and maintenance problems, and there is a continuing cathodic protection concern due to the co-location of the pipeline with overhead transmission and distribution lines. There are also several petroleum pipelines that cross the water line. The existing line was not installed deep enough in many areas along the right-of-way, and soil erosion in several washes and gulches has left the pipeline exposed and subject to damage. Further, in at least four instances trailer homes and farm operations have encroached on the pipeline right-of-way, making any maintenance operations difficult.

The new line would follow the alignment of the existing pipeline and would connect to existing distribution service laterals along the route. A construction right-of-way 100 feet wide would be used to install the pipeline, and a permanent right-of-way 50 feet wide would be dedicated to its exclusive use. The existing pipeline would be abandoned to the point on the north of the San Juan River just west of Hogback. At that point, the existing pipeline and distribution system laterals along the Hogback Canal would remain in service. The new pipeline would deviate from the existing route to avoid wetlands and construction restrictions, and would follow a new alignment west to Shiprock. Where the pipeline crosses drainage canals, irrigation ditches, other pipelines, roads and other utilities, sufficient separation and construction measures would be employed.

The first section of the new pipeline would be about 13.1 miles long with a diameter of 24 inches. It would have approximately 32 turnouts and would supply water to the Upper Fruitland Chapter, parts of the San Juan Chapter, and potable water for the Navajo Agricultural Product Industries (NAPI). The elevation at the terminus with the City of Farmington water treatment facility would be 5,230 feet. An existing siphon under the San Juan River would be replaced with a new 24-inch concrete siphon.

The second section would begin near Nenahnezad and end at the eastern boundary of the Hogback Chapter. It would be about 4.3 miles long with a diameter of 20 inches, and would have approximately 9 turnouts to serve the Nenahnezad Chapter. The initial elevation of this reach would be 5,360 feet. At the end of this section, a 16-inch diameter concrete siphon would cross under the San Juan River to replace the existing siphon.

Map 2-7 Navajo Nation Municipal Pipeline Alternatives

[back page of Map 2-7]

A new pumping plant would be constructed to provide sufficient pressure to the distribution systems, and would be located on a hillside near Nenahnezad. The pumping plant would include a forebay tank to receive gravity flow through the existing 18-inch pipeline and isolate the pipeline from pump start and shutdown surges. Two existing pumping plants on the mainline would be closed. A 1.5 million gallon (MG) water storage tank would be constructed near Nenahnezad to replace an existing 40,000 gallon storage tank.

Another option for Alternative NNMP-1 would be to increase the diameter of the first section of the pipeline from 24 to 42 inches, and to decrease the diameter of the fourth section from 16- to 14-inches. The pipeline would then be pressurized with sufficient pressure to eliminate the need for a new pumping plant. However, the engineering and cost for NNMP-1 as herein described is based on the smaller line and pumping plant.

The third section would begin at the north side of the San Juan River at the Hogback Diversion structure. It would be about 5.0 miles long with a diameter of 20 inches, and would be routed on a new right-of-way north of the Hogback Canal, on the south side of Highway 550. It would follow this route west from Hogback until it rejoins the existing route east of Shiprock. This deviation from the existing route is to avoid extensive wetlands which have been established, and are maintained, from seepage out of the Hogback Canal. Construction along the existing pipeline right-of-way paralleling the Hogback Canal and service road would also be very difficult. The existing pipeline would be left in place, and maintained in service, for the homes located south of the Hogback Canal.

The fourth section of the new pipeline would be about 6.2 miles long with a diameter of 16 inches. This section would have several turnouts and would supply water to the BIA and the greater Shiprock community and outlying areas. The final section would terminate at the Cortez Tank in Shiprock at an elevation of 5,120 feet.

Storage tanks would be constructed in Shiprock to hold an additional 5.5 MG, increasing to 7.0 MG the total storage capacity at the existing Cortez Tank site. This additional storage volume is to provide service to meet local peak flow needs, and to add reliability to the system for line interruptions, maintenance shut downs, or fire fighting.

The existing diversion from the San Juan River at Shiprock, and the Shiprock water treatment plant would be closed, and the Farmington water treatment plant would supply the treated water for the entire NNMP-1 service area. The NTUA is consuming less treated water than the maximum permitted under its contract with Farmington, and the Farmington treatment plant has excess capacity to handle the increased flows in the NNMP system. Also, the Shiprock treatment plant has been plagued with problems of sand clogging the system, resulting in interruptions of operation and high maintenance. Eliminating diversions and closing the Shiprock treatment plant would eliminate these problems.

Alternative NNMP-2

This alternative would repair and leave in service the eastern portion of the existing pipeline, from Farmington to Hogback, while improvements would be made to the western portion of the system from Hogback to Shiprock. In addition, additional M&I water storage facilities would be required at Shiprock and at Nenahnezad, and upgrades to the existing Hogback pumping plant and Shiprock water treatment plant would be made. A limited amount of new pipeline would be constructed.

The water system would function as two independent sections, with an emergency interconnection. The approximately 17.4-mile eastern section, that includes NTUA service areas of Upper Fruitland, Nenahnezad, Morgan Lake, Lower Fruitland, and a connection for the NAPI service area, would continue to be supplied with treated water through the existing pipeline between Farmington to Shiprock. The approximately 11.2-mile western section that includes Hogback, Shiprock, and the service areas north, west, and south of Shiprock would be supplied with water diverted directly from the San Juan River at the Hogback Diversion, and then treated at the Shiprock water treatment plant and distributed to the Shiprock area. The portion of the existing pipeline between Hogback and Shiprock would serve for local distribution of water from Shiprock and the section across the San Juan River between Lower Fruitland and Hogback would remain in place as an emergency connection. Shiprock could receive treated water from Farmington in limited quantity through this connection.

The existing pipeline system would be used, with new appurtenances to improve service. A new pumping plant would replace two existing pumping plants. It would be required to provide sufficient pressure to the distribution systems, and would be located on a hillside near Nenahnezad. The pumping plant would include a forebay tank to receive gravity flow through the existing 18-inch pipeline and isolate the pipeline from pump start and shutdown surges. A 1.5-MG water storage tank would be constructed at Nenahnezad as well to replace an existing 40,000-gallon storage tank. Finally, the existing cathodic protection system on the eastern section of pipeline would be updated and improved, to protect against electrolytic interference and corrosion from external sources (e.g., adjacent power lines and pipelines). Where possible, additional earth cover would be added to areas where the pipeline has become exposed, and measures to approve entrances onto the right-of-way would be taken to the extent feasible.

Water would be diverted from the San Juan River at the Shiprock Diversion, and treated to serve the M&I water users in the Shiprock area. The improvements to this western section of the system include replacement and upgrading of a portion of the existing pipeline, improving the San Juan River diversion structure, expanding and upgrading the existing Shiprock water treatment plant, and constructing additional storage tanks.

New pipelines would be constructed from the modified Shiprock water treatment plant to the Cortez Tank storage facility. These pipelines would consist of 1.9 miles of 14-inch pipeline, and 0.7 mile of 16-inch pipeline. The remainder of the 11.2 miles of 20-inch and 14-inch pipeline in the western section would remain in service with no changes or modifications.

The existing diversion and intake structure is located in the San Juan River about 400 feet upstream of the Highway 550-666 Bridge. It stands 35 feet out from the northeast shore and is accessed with a metal footbridge. It would be modified to operate with an on-shore sand settling facility, and the existing pumps and piping would be replaced with abrasive slurry pumps (Molzen-Corbin 1993). New inlet gates would be installed. A temporary cofferdam would be emplaced to repair leakage in the buried discharge pipe casing.

The existing water treatment plant along Highway 666, 0.5 mile north of Highway 550 in Shiprock would be expanded to about twice its current size with the addition of a third unit. The existing two units would be renovated and modified to combine with new construction and form an efficient plant of a total of 3.0 to 4.0 million gallons per day (MGD) capacity with space for future expansion to about 7.0 MGD. The high turbidity in the San Juan River, and the high level of sand in the intake water, have caused interruptions in operation of the treatment plant in the past. A gravity sand separator would be constructed on land along the river close to the intake structure. The sand separator would consist of an

open top concrete tank about 90 feet by 12 feet protruding about 8 feet above the ground surface, with a pump and control building alongside measuring about 15 by 20 feet. In operation, the sand separator would settle sand down to 0.10-millimeter size and gather it to sluice back to the river or to adjacent drying beds. No chemicals would be added. Based on the current practice at the treatment plant, the material is suitable sand fill for construction and is readily hauled away. About two acres of additional land would be required for these treatment plant modifications.

Additional storage tanks would be constructed in Shiprock to hold an additional 4.0 MG, increasing to 7.0 MG the total storage capacity at the existing Cortez Tank site. This additional storage volume is to provide service to meet local peak flow needs, and to add reliability to the system for line interruptions, maintenance shut-downs, or fire fighting.

Alternative NNMP-3

This alternative would make use of the NIIP facilities, an element of the Upper Colorado River Storage Project, but modifications to the system would be made so that it would provide a reliable, year-round supply of M&I water for the eight Navajo Nation chapters. Currently, the NIIP is only designed to operate during the irrigation season and portions of the system would have to be winterized to allow year-round operation. A small 2,000 af reservoir would be constructed and new pipelines, a new water treatment plant, and new water storage tanks would also be required.

The NIIP diverts water from Navajo Reservoir through the Main Canal and delivers water to lands east and south/southwest of Farmington. Under Alternative NNMP-3, the Main Canal would be used to divert water from Navajo Reservoir to meet the water demand required for the eight Navajo Nation chapters. However, since there is not sufficient capacity in the Main Canal to hold all the water required for both the NIIP project demand as well as the M&I demand of the chapters, a small reservoir would be constructed near Gallegos Canyon southeast of Farmington. The reservoir would be operated as a regulating reservoir and would allow for storage of water during the highest demand season (summer) and for storage during the fall.

A new 18-inch pipeline would be built about 11 miles from the Gallegos Reservoir to Nenahnezad, where it would connect with the existing pipeline. The existing pipeline would be used to serve the chapters on the eastern portion of the service area, from Farmington to Hogback. No pumping plant would be required, since the elevation of the Gallegos Reservoir would allow operation as a gravity system. The two existing pumping plants would be closed. A 1.5-MG water storage tank would be constructed at Nenahnezad to replace the existing 40,000-gallon storage tank to provide peak-hour regulation and emergency storage in that area.

About 13.5 miles of 16-inch pipeline would be constructed from just south of Hogback to Shiprock. It would cross under the San Juan River near the existing Hogback Diversion and then follow the route of Alternative NNMP-1 from Hogback to Shiprock. The existing pipeline that parallels the Hogback Canal would stay in service, while the existing pipeline from Highway 550 north to the Cortez Tank site in Shiprock would be replaced.

Additional storage tanks would be constructed in Shiprock to hold an additional 4.0 MG, increasing to 7.0 MG the total storage capacity at the existing Cortez Tank site. This additional storage volume would provide service to meet local peak flow needs, and add reliability to the system for line interruptions, maintenance shut-downs, or fire fighting.

A new 8.0-MGD water treatment plant would be constructed at the Gallegos Reservoir to treat the water from the NIIP system before it is put in the pipelines. The Shiprock intake structure on the San Juan River would be closed, as would the Shiprock water treatment plant.

Comparison of NNMP Alternatives

The alternatives for the NNMP would all provide a reliable water source for the chapter areas between Farmington and Shiprock and for the Shiprock area. The method of conveyance of the water would likewise be similar in that systems would require construction of a pipeline and associated facilities. The following provides a summary of the three NNMP alternatives in terms of their general environmental impacts and their technical and economic considerations. **Table 2-54** provides a summary of the features and costs of the alternatives. No comparison of the alternatives ability to meet the purpose and need of the project was done since the NNMP pipeline is not part of the Settlement Act.

Table 2-54 Comparison of Navajo Nation Municipal Pipeline Alternatives			
Facility/Feature	Alternative NNMP-1	Alternative NNMP-2	Alternative NNMP-3
New Pumping Plants	12.5 cfs/350 HP	2.6 cfs/60 HP	None
Miles of New Pipeline	28.6	2.6	24.7
Water Treatment Plant ^a	Close Shiprock plant, use Farmington plant for water supply	Expand Shiprock plant from 2.0 MGD to 6.5 MGD	Close Shiprock plant, construct new Gallegos Plant 8.0 MGD
Sand Settling Facility	None	Construct new 130,000-gallon facility	None
Water Source	Farmington water treatment plant	Farmington water treatment plant and direct diversion at Shiprock	NIIP Canal
New Water Storage Tanks	7.0 MG (1.5 and 5.5 MG)	5.5 MG (1.5 and 4.0 MG)	5.5 MG (1.5 and 4.0 MG)
Reservoirs ^b	None	None	Construct Gallegos Reservoir (2,000 af)
Construction Cost	\$24 million	\$17 million	\$50 million
^a Water treatment facilities would be constructed or expanded to 4.0 MGD initially, and in 2.0 MGD steps thereafter in phases. ^b NNMP-3: Store for 151 days + losses 2,000 af (Nov 1-April 30 + July)			

NNMP-1

Under NNMP-1, a new 24-inch pipeline and pumping plant would be constructed between Farmington and Shiprock along a portion of the existing alignment of existing NTUA pipeline. No new diversion point would be needed since the treated water would be supplied from the Farmington water treatment plant and its existing diversion on the Animas River. The existing water treatment plant in Shiprock would be closed and its associated intake also closed. A new 1.5 MG water storage tank would be constructed near Nenahnezad to replace an existing 40,000-gallon storage tank, and 5.5 MG in additional tank storage would be constructed in Shiprock at the Cortez Tank site. The more significant

environmental impacts for NNMP-1 are summarized in **Table 2-55**. **Table 2-56** provides a summary of the technical and economic factors considered in the evaluation.

Table 2-55 Alternative NNMP-1 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	There would be a temporary increase in sediment load in the San Juan River during construction of crossings, and a potential impact to fish. There would be no impacts from construction. No additional impacts to trout and native fish in the Animas River since no new diversion or increased diversion to the Farmington water treatment plant would be needed.
Cultural and Paleontologic	No known sites would be affected; however, pre-construction surveys would be required along the alignment.
Hydrology	No significant change in flows to the Animas River at the confluence with the San Juan River. There would be impacts on the San Juan River below the confluence with the Animas River down to the Four Corners region as a result of implementation of Refined Alternative 4 or Refined Alternative 6, but not directly associated with the NNMP.
Recreation	No direct adverse impacts to recreation would occur as a result of construction or operation of the NNMP.
Socioeconomic (Construction)	Increased gross sales revenues and jobs would be created in San Juan County as result of construction of the NNMP-1.
Socioeconomic (Operation)	Increased M&I water to Navajo chapters could have a positive effect on economic growth in this area.
Special Status Species	Potential disturbance to southwestern willow flycatcher nesting sites along the San Juan River could occur as a result of construction of two river crossings.
Water Quality	There would be temporary increase in sediment load in San Juan River during crossing construction. There would be no impacts from operations.
Wetlands/Vegetation	Temporary impacts could occur as a result of construction along the alignment for 29 miles. There could be removal of some large trees.
Wildlife	Temporary disturbance to wildlife habitat could occur during construction along the alignment.

Table 2-56 Alternative NNMP-1 Summary of Results of Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Alternative NNMP-1 would satisfy the ITAs by providing a reliable water source.
Feasibility	NNMP-1 would be feasible to construct.
Development Costs	\$24 million.
Operation, Maintenance, and Replacement Costs	\$1.04 million.
Public Safety	NNMP-1 would not pose or increase any risks to public safety.
Impacts to Ongoing Operations	No impacts were identified.

NNMP-2

NNMP-2 would involve the repair, and would leave in service ,the eastern portion of the existing system from Farmington to Hogback, while improvements would be made to the western portion from Hogback to Shiprock. The source of the water for the eastern portion would be supplied with treated water through the existing pipeline from Farmington to Shiprock. For the western section, water would be supplied with water diverted directly from the San Juan River at the Shiprock Diversion, then treated. Like NNMP-1, this alternative would require a new pumping plant, including a forebay, and replacement of two existing pumping plants. A new 1.5-MG water storage tank would be constructed near Nenahnezad, and 4.0 MG of additional storage would be constructed at the Cortez Tank site in Shiprock. The more significant environmental impacts for NNMP-2 are summarized in **Table 2-57**. **Table 2-58** provides a summary of the technical and economic factors considered in the evaluation.

Table 2-57 Alternative NNMP-2 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	Increased diversions at the Shiprock intake could impact fishery resources in the San Juan River.
Cultural and Paleontologic	Same as described under NNMP-1
Hydrology	Same as described under NNMP-1. There would be no additional impacts as a result of new diversion at the existing Shiprock Intake.
Recreation	Same as described under NNMP-1
Socioeconomics (Construction)	Same as described under NNMP-1
Socioeconomics (Operation)	Same as NNMP-1
Special Status Species	No impacts would result.
Water Quality	No impacts from operations would result.
Wetlands/Vegetation	Same as described under NNMP-1, plus construction impacts at the treatment plant site.
Wildlife	Same as described under NNMP-1, plus construction impacts at the treatment plant site.

Table 2-58 Alternative NNMP-2 Summary of Results of Technical and Economic Factors	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under NNMP-1.
Feasibility	Same as described under NNMP-1.
Development Costs	\$17 million.
Operation, Maintenance, and Replacement Costs	\$1.02 million.
Public Safety	Same as described under NNMP-1.
Impacts to Ongoing Operations	Same as described under NNMP-1.

NNMP-3

For NNMP-3, the existing NIIP facilities would be used to deliver water from Navajo Reservoir to the Farmington/Shirock areas. This alternative requires that a regulating reservoir and water treatment plant be constructed near Gallegos Canyon and a new pipeline constructed from the reservoir to the existing NNMP pipeline. No new pumping plants would be needed for this alternative. Like the NNMP-1 and NNMP-2 Alternatives, an additional 1.5-MG water storage tank would be constructed at Nenahnezad, and 4.0 MG of additional tank storage would be constructed in Shirock at the Cortez Tank site. Like alternative NNMP-1 a new 14-inch pipeline would be constructed from near the Hogback to Shirock. The more significant environmental impacts for NNMP-3 are summarized in **Table 2-59**. **Table 2-60** provides a summary of the technical and economic factors considered in the evaluation.

Table 2-59 NNMP-3 Impacts to Environmental Resource Areas	
Resource Area	Description of Impacts
Aquatic	Same as described under NNMP-1.
Cultural and Paleontologic	Same as described under NNMP-1.
Hydrology	Same as described under NNMP-1.
Recreation	Same as described under NNMP-1.
Socioeconomic (Construction)	Similar to NNMP-1 and 2 but there would be a greater increase in gross revenues because of construction of additional facilities (reservoir, water treatment plant, and pipeline).
Socioeconomic (Operations)	Same as described under NNMP-1.
Special Status Species	Potential disturbance to southwestern willow flycatcher nest sites along San Juan River as a result of construction underground crossings at Hogback could occur.
Water Quality	There would be a temporary increase in sediment load in San Juan River during construction of diversion. There would be no impacts from operations.
Wetlands/Vegetation	There would be additional disturbance beyond that which would occur with NNMP-1 and 2 as a result of construction of the Gallegos Reservoir and additional 11.1 miles of pipeline, and new 8.0 MGD water treatment plant.
Wildlife	Same as described under NNMP-1.

<p>Table 2-60 Alternative NNMP-3 Summary of Results of Technical and Economic Factors</p>	
Technical/Economic Category	Description of Results
Indian Trust Assets	Same as described under NNMP-1.
Feasibility	Same as described under NNMP-1.
Development Costs	\$50 million.
Operation, Maintenance, and Replacement Costs	\$0.96 million.
Public Safety	Same as described under NNMP-1.
Impacts to Ongoing Operations	Same as described under NNMP-1.

Recommendations

On the basis of the comparison of the three alternatives, no significant long-term environmental impacts would be expected. NNMP-1 would replace a 30-year old pipeline with a new pipeline and eliminate problems with cathodic protection, leaks, and loss of earth cover from soil erosion. Its construction costs are higher, but the alternative provides increased reliability over NNMP-2 and is preferred.

NNMP-3 has higher construction costs, and it offers no additional environmental or reliability benefits over NNMP-1. Therefore, NNMP-1 is selected as the preferred alternative to provide M&I service to the eight Navajo Nation chapters. NNMP-1 is carried through the discussion of environmental setting, impacts, and mitigation measures in Chapter 3, and the discussion of Environmental Justice and ITA issues in Chapter 4.

2.5.1.3.4 Electrical Transmission Lines

WAPA would provide electrical power to the ALP Project and would conduct a systems studies to determine how power could be delivered. WAPA would then conduct an environmental review of its electrical power delivery system.

2.5.1.3.5 Ridges Basin Reservoir Recreation Elements

Refined Alternative 4 consists of two recreation-related elements within Ridges Basin. One element is the establishment and maintenance of a 30,000 af minimum pool in Ridges Basin Reservoir for the purpose of enabling the reservoir to support a fishery and to improve water quality. The second element, not directly incorporated into this alternative, consists of the development of facilities that would provide for a broad range of recreational activities at the reservoir site and surrounding area.

Minimum Pool Establishment

Under Refined Alternative 4, Ridges Basin Reservoir would have a total capacity of 120,000 af. Of this, 30,000 af would be maintained primarily as a minimum pool for fishery and water quality purposes.

Operational parameters would, however, allow for drawdown below this minimum pool during some dry years. This allowance results in reduced construction costs and capacity that would otherwise be necessary, and would likely have a minimal impact on the fishery within the reservoir.

Recreational Facilities

It is anticipated that under Refined Alternative 4, a non-federal entity could develop expanded recreational facilities within Ridges Basin. Such development would be subject to coordination with, and approval by, Reclamation. The Ridges Basin Reservoir surface area under Refined Alternative 4 envisions the following characteristics as a potential recreational development scenario:

- 1,980 people at one time
- 218,400 annual user days
- 10 miles of hiking trails (same as proposed in the 1996 FSFES)
- 196 camping units
- 37 picnic units and one group site
- One, four-lane boat ramp and 26 boat slips
- Two-lane county access road
- 591 parking stalls
- Public beach
- Fish cleaning station
- Entrance station and administrative building

The potential locations of these facilities are indicated on **Map 2-8**. These facilities could require approximately 128 acres (same as proposed in the 1996 FSFES). Electrical and potable water supplies would also be developed, as well as wastewater and solid waste disposal facilities and programs. The development of recreational facilities could also require either a realignment of CR 211 or the construction of a new roadway that would connect CR 211 with Wildcat Canyon Road (CR 141) as shown on Map 2-8. Facilities would be available for use during the summer season (including late spring and early fall) and would be closed to the public during winter months. Recreation facilities would be planned and designed to be compatible with fish and wildlife plans for the Ridges Basin area as presented later in this report.

2.5.1.3.6 Relocations

Gas Line Relocations

Four gas pipelines lie within the reservoir area. The three owned by Northwest Pipeline Corporation (Northwest) and Mid-American Pipeline Company (MAPCO) would need to be relocated in order for dam construction to proceed. Based on a relocation route analysis and subsequent Reclamation decisions, the preferred relocation corridor is south of Ridges Basin on portions of Southern Ute Tribal land. Reclamation is working with the Southern Ute Indian Tribe to identify and address its concerns. The fourth pipeline, owned by Greeley Gas Company, extends from a connection with the Northwest natural gas pipeline in the Ridges Basin Reservoir area to the City of Durango along an alignment parallel with CR 211. A section of the Greeley line would require relocation so that it can tie into the relocated Northwest pipeline.

County Road 211

Portions of the existing CR 211 would be inundated by the reservoir and would be relocated above the future high water level. Two routes are under consideration. Each route would begin at CR 211 on the west side of the crest of Bodo Draw and proceed west about 1.3 miles along the low hills north of the proposed reservoir and near the 115-kilovolt Tri-State Generation and Transmission Association transmission line. At that point, one alternative would turn to the north, up a draw, then continue westerly on top of the ridge 1.8 miles to an intersection with Wildcat Canyon Road (CR 141) at the entrance to the Rafter J residential area. The other alternative would continue west, cross the electric transmission line and continue 1.2 miles on the uphill (north) side of the transmission line to junction with existing CR 211 west of the future high water level. The final selection of the route for CR 211 would take into consideration the need to reduce impacts to wildlife associated with construction of CR 211 and recreational development.

2.5.1.3.7 Construction Program

Project construction would span a period of five to five and one-half years. Beginning with final design engineering, the relocation of gas pipelines would start while the specifications and construction documents are being completed for the dam. At the dam site, excavation of the tunnel portals and tunnel construction would start once the gas lines are removed, about six to eight months from project start. While tunnel construction for the outlet works is underway, the cut-off wall and dewatering wells would be installed, the outlet works stilling basin and channel constructed with the objective of completing stream diversion into the tunnel within 18 months under the dam contract or about 24 to 26 months along the project schedule. The pumping plant and conduit work would begin with equipment delivery times on the order of 12 to 14 months anticipated. Foundation excavation at the dam would be programmed for 8 to 10 months and embankment construction for 20 to 30 months depending on whether double shifts are used. Fish and wildlife mitigation features would be constructed as outlined in Chapters 3 and 5 of this DSEIS.

Land Acquisition

Reclamation currently owns 4,638 acres of land in the Ridges Basin area. For project construction proposed acquisitions include about 800 acres to complete the reservoir land, about 830 acres for the borrow area and access, 46 acres for the pumping plant, and easements for increased flows in Basin Creek. Approximately 2,500 to 3,000 acres would be required for wildlife and wetland mitigation.

Estimated Construction Cost

Estimated construction costs were based on construction quantities measured on preliminary design drawings and on unit prices selected from similar work. Major equipment items were priced based on manufacture quotations with experience-based allowances for installation. Unit prices based on earlier years have been updated to April 1999 using construction indexes of the Reclamation Construction Cost Trends weighted for earth dams, pumping plants, and steel pipelines. The estimated construction costs are summarized in **Table 2-61**. A construction contingency amount of 20 percent, considered appropriate for preliminary design level, is listed separately. Previous Reclamation estimates have included this percentage within the itemized costs rather than listing it separately. To the total field cost, 30 percent is added to obtain the total construction cost. It includes the items of field investigations, engineering design, construction inspection and administration, and legal and environmental compliance costs.

Map 2-8 Utilities and Roadway Relocations and Recreation Facilities Associated with Ridges
Basin Reservoir

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Quantities and estimated costs are detailed in Attachment E, Feasibility Designs and Estimates. For the total project costs, several items must be added to the estimated construction cost including, cultural resources activities, recreation facilities, fish and wildlife mitigation, wetlands mitigation, water quality mitigation, NNMP, permanent operating facilities, operating equipment, water acquisition fund, sunk costs and interest during construction. See Section 2.5.1.3.9 for an accounting of the total cost of the Structural Component for Refined Alternative 4.

Table 2-61 Construction Cost Estimate Summary Ridges Basin Dam, Durango Pumping Plant and Ridges Basin Inlet Conduit (Estimated Cost in Millions of Dollars)	
Item	Cost (\$ million)
Dam	93.0
Land Acquisition	6.7
Relocations	13.0
Access and Clearing	2.7
Basin Creek Improvement	4.6
Dam Structure	57.6
Outlet Works	6.9
Initial Filling	1.5
Intake Pumping Plant	26.8
Land Acquisition	2.5
Access and Site Improvements	0.8
Intake Works	1.9
Plant Structure and Equipment	20.7
Surge Control	0.9
Inlet Conduit	5.6
Land Acquisition	0.3
Pipeline	4.8
Discharge Channel	0.5
Subtotal Field Costs (April 1999)	125.4
Add Construction Contingency (20%)	24.6
Total Field Cost	150.0
Add Engineering Design, Inspection, Administrative, and Legal Costs (30%)	45.0
Total Construction Cost	195.0

Operating Costs

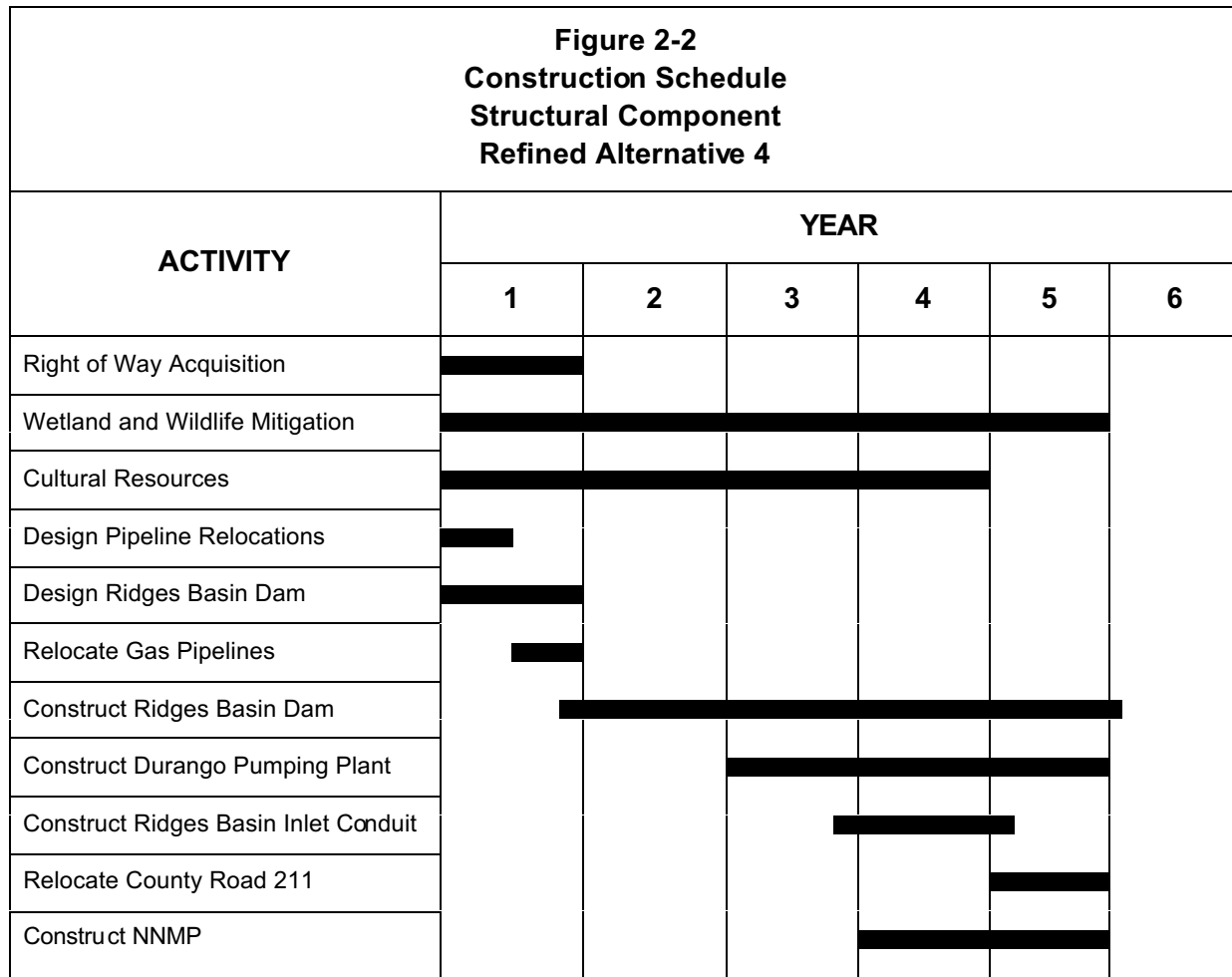
Operating costs in this summary includes operating and maintenance personnel, equipment operating and repair cost and electrical power for pumping. For future full project, operation personnel requirements were estimated to include a supervisor, records clerk, four pumping plant operators and two maintenance

workers for Ridges Basin Dam and Reservoir, Durango Pumping Plant, and Ridges Basin Inlet Conduit. In the initial years, fewer personnel would be employed. Computerized supervisory control may reduce the number of pumping plant operators. Repairs and services include annual payments made to a fund for pumping and electrical equipment repair and dam maintenance expense that is beyond the capacity of the regular maintenance personnel. Recreation area fee collectors and boat ramp and patrol personnel are assumed to be contracted separately and covered by the fees collected. Operating costs are detailed in Attachment E, Feasibility Design and Estimate, and summarized on annual and af bases in **Table 2-62**.

Table 2-62 Summary of Annual Operating Costs Ridges Basin Dam and Reservoir and Durango Pumping Plant		
	Quantity	Cost
Pumping Power		
Summer Demand	18,500 kW	\$381,000
Winter Demand	7,800 kW	161,000
Energy Use	68,800 MWh	557,000
Annual Power Cost		\$1,099,000
Other Operating Costs		
Personnel	8 persons	\$320,000
Maintenance Equipment Operation		30,000
Repairs and Services		70,000
Subtotal		420,000
Total Operating Cost		\$1,519,000
Power Cost \$/af		\$12.18
Project Operating \$/af		\$13.68
Notes: Power cost based on hydrological model derived average pumping into Ridges Basin of 90,200 afy. Rates applied: \$3.43 per month per kW demand, 8.1 mills per kWh. Project operating cost based on apportioning power cost, personnel, maintenance and repair cost to the project diversion of 111,000 afy.		

Construction Schedule

The construction schedule for Refined Alternative 4 is depicted in **Figure 2-2**. The construction period is expected to take about five to five and one-half years for completion. The longest time period for construction would be the construction of Ridges Basin Dam.



2.5.1.3.8 Mitigation Measures

Mitigation measures are discussed in the various resource sections of Chapter 3 and in the Indian Trust Asset and Environmental Justice section of Chapter 4. Mitigation measures are proposed for all adverse impacts when possible to reduce or avoid the impacts identified. Section 5.4 discusses Reclamation's and Interior's commitments to implement these mitigation and other impact avoidance. Costs for environmental compliance during the construction phase are part of the 30 percent contingency cost for engineering design, inspection, administrative and legal services displayed in Table 2-61 and are routinely estimated to be 4 percent of the field costs. Other mitigation costs for wetlands, wildlife, and cultural are contained in Table 2-63 in the following section.

2.5.1.3.9 Total Costs for Refined Alternative 4

Table 2-63 displays the total costs for Refined Alternative 4. The largest cost item is for the major structural features of Ridges Basin Dam, Durango Pumping Plant, and Ridges Basin Inlet Conduit. Construction cost for these combined features, including contingencies, is estimated to be \$195 million.

Table 2-63 Present Worth Cost Structural Component Refined Alternative 4	
Item	Present Worth Cost
Construction Cost for Ridges Basin Dam, Durango Pumping Plant and Ridges Basin Inlet Conduit	\$195 million
Navajo Nation Municipal Pipeline	\$24 million
Recreation Development	\$12 million
Wetland and Wildlife Mitigation	\$12.1 million
Cultural Resources	\$7.5 million
Total Present Worth Cost of Structural Component	\$250.6 million
Water Acquisition Fund (Non-Structural Component)	\$40 million
Total Capital Cost for Refined Alternative 4	\$ 290.6 million

2.5.1.4 Description of Non-Structural Component of Refined Alternative 4

The non-structural component of Refined Alternative 4 would consist of the creation of a water acquisition fund (\$40 million) that could be used by the Colorado Ute Tribes to acquire water rights on a willing buyer/willing seller basis in an amount sufficient to allow the Tribes approximately 13,000 afy of depletion in addition to the depletion from the structural portion of the project. However, to provide flexibility in the use of the fund, authorization would allow some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities. (See Section 2.3.2.1.2, non-structural components discussion of Alternative 1).

2.5.1.4.1 Amount of Land Purchased in Various River Basins

It is estimated that purchase of 10,300 acres of irrigated land, distributed in four river basins would be necessary to obtain the 13,000 afy of depletion described above. The acreage is distributed among the four basins as follows:

- Pine River Basin - Purchase 2,300 acres of land and leave water on the land
- La Plata River Basin- Purchase 2,400 acres of land and leave water on the land
- Animas/Florida River Basins - Purchase 2,300 acres of land and leave all the water on the land
- Mancos River Basin - Purchase 3,300 acres of land leave water on the land

The cost of acquiring the water rights would include the purchase price of the land, the cost of transferring water rights, and the cost measures to avoid or mitigate impacts to wetlands and cultural resources. The land cost was determined through the process described in Attachment D.

2.5.1.4.2 Implementation Schedule for Purchase of Land for Refined Alternative 4

The purchase of land and water rights would span a period of 15 years, as shown on **Figure 2-3**, to allow time for willing sellers to provide the necessary amount of land and water rights.

Figure 2-3 Implementation Schedule Refined Alternative 4 Purchase of Land and Water Rights			
Item	Years (15 Years Total)		
	0-5	6-10	11-15
Purchase of 10,300 acres			
* Pine River (purchase 2,300 acres)			
* La Plata River (purchase 2,400 acres)			
* Animas/Florida River (purchase 2,300 acres)			
* Mancos River (purchase 3,300 acres)			
Cultural Resources Surveys			
Note: In addition if water is removed from the land for other uses the following activities will need to take place			
Engineering/Legal Support for Water Right Purchase			
Design for Avoidance of Wetland Impacts			
Wetland and Wildlife Mitigation			

2.5.1.5 Conveyance Options to Deliver Municipal and Industrial Water to Future Non-Binding End Uses

Likely conveyance corridor routes were identified (see **Map 2-9**) to most efficiently link water sources to future water uses. For purposes of analysis, reservoirs or water tanks would be required to store M&I water through dry months. A reservoir to store Animas River water would be located at Ridges Basin, and existing municipal storage facilities at Shiprock and the other communities would be used where required. Pumping plants and water treatment plants would be located along the conveyance corridor routes where needed.

A branching pipe system with a water treatment plant and a pumping plant would extend eastward from Ridges Basin Reservoir to serve locations in the Florida Mesa area and areas located adjacent to the Animas River below the City of Durango. The Florida Mesa Lateral and the Sunnyside Lateral would deliver water to these areas.

O Florida Mesa Lateral

The Florida Mesa Lateral is a pipeline that would begin at the Ridges Basin Dam and run to the east. It would cross the Animas River and then follow along the Highway 160 corridor for about 4 miles. It would then turn and follow a southeasterly direction to a potential residential development on the Southern Ute Indian Reservation. The length of the Florida Mesa Lateral would be approximately 9 miles.

A water treatment plant would be located along the pipeline in an area between Ridges Basin Reservoir and the Animas River at elevation 6,745 feet. A pumping plant would be located at the outlet of the treatment plant because the treatment plant is about 250 feet lower than the terrain along the pipeline alignment in the vicinity of the community of Loma Linda.

O Sunnyside Lateral

The Sunnyside Lateral is a pipeline that would begin at a turnout on the Florida Mesa Lateral on the west side of the Animas River. The Sunnyside Lateral would run south along the west side of the river for about 4 miles and then cross the Animas River and continue south on the east side of the Animas River. The length of the Sunnyside Lateral would be approximately 7 miles.

In addition to these two laterals, two other pipeline/conduit laterals are possible. One would deliver water from the Ridges Basin Dam to the City of Durango, and the other would convey water from Ridges Basin down Basin Creek to the Animas River.

Durango Municipal and Industrial Pipeline Lateral

A flange would be provided in the outlet works at Ridges Basin Dam to allow the City of Durango to receive project water directly from the reservoir into a new pipeline that the city may construct in the future. The pressurized pipeline would be approximately 20 inches in diameter and would be constructed of steel or plastic. The pipeline would be routed down the dam access/haul road toward Borrow Area B then turn east across Blue Mesa north of the runway of Animas Airport. From this point it would follow the route of La Posta Road (CR 213) north to Durango to tie into the M&I water distribution system for the city. City pumps would lift it through a connection with the existing water pipeline to the city terminal reservoir.

Instead of following the La Posta Road north to Durango, an alternative route would be to the south to serve water users south of the City along the Animas River. A water treatment plant would be located along the pipeline in an area between Ridges Basin Reservoir and the Animas River at elevation 6,745 feet near the Animas Airport. A pumping plant would be located at the outlet of the treatment plant. The distance from the pipeline to the water treatment plant is approximately 3 miles. A pipeline from there north to the Durango Pumping Plant and the existing crossing of the Animas River would be 4 miles, while a pipeline south would be approximately 5 miles long.

Insert Map 2-9 Potential Water Conveyance Routes for Non-Binding Tribal M&I Water End Uses Under Refined Alternative 4

[back page of map 2-9]

o Basin Creek Discharge Lateral

The primary method of discharge from Ridges Basin to the Animas River would be to release the water directly into Basin Creek which flows into the Animas River. An alternative to discharging water to users directly from the Ridges Basin Dam into Basin Creek would be to construct a reinforced concrete or steel conduit 42 inches in diameter which would be placed approximately parallel with the creek and carry released flows to the river. Using the haul road route to Borrow Area B and private property downstream, conduit installation would leave the streambed relatively undisturbed. The maximum discharge to water users would be about 130 cfs. The conduit would be approximately 3 miles long and include 2 crossings of Basin Creek and a stilling basin before entering the river.

o Coal Mine/Power Plant Lateral

The Coal Mine/Power Plant Lateral is a pipeline which would begin on the south shore of Ridges Basin Reservoir, cross the saddle between Ridges Basin and the Red Mesa area, and continue in a southerly direction to a point north of the New Mexico state line. This lateral would serve potential development based on coal resources of the Southern Ute Indian Reservation. The pipeline would have two pumping plants in Ridges Basin, one at the south side of the reservoir and one along the ascent to the saddle separating Ridges Basin from the Red Mesa area. The pipe elevation at the saddle would be about 7,420 feet.

After crossing the saddle, the Coal Mine/Power Plant Lateral would continue in a south-southwesterly direction for approximately 13 miles, and end at a potential power plant site located about 3 miles north of the Colorado/New Mexico state line and about 4 miles east of Highway 140. This site was selected because of its close proximity to coal reserves which would be used to fuel the power plant. Water would also be served to a potential coal mining development in the vicinity of the power plant. Most of this alignment would be along an existing road. Turnouts from the Coal Mine/Power Plant Lateral could supply water for future coal mining north of the initial mine development in the vicinity of the power plant.

o Breen/La Plata Lateral

The Breen/La Plata Lateral would begin at a turnout on the Coal Mine/Power Plant Lateral, approximately 1.6 miles south of the saddle separating the Red Mesa area from Ridges Basin. The lateral would run southwestward through the Red Mesa area into New Mexico, ending at the town of La Plata. The lateral would serve future housing needs in the La Plata area for the Southern Ute Indian Tribe.

A water treatment plant would be located about 0.8 mile west of the turnout, at approximately elevation 7,380. From the treatment plant, the domestic water pipeline would continue due west to Highway 140, meeting the highway in the vicinity of Breen. The pipeline would turn to the south and run along the highway through the Red Mesa area and across the Colorado and New Mexico state line. The pipeline would depart from Highway 140 for a couple of miles to run through the community of Marvel. The total length of the pipeline would be approximately 24.2 miles.

o Alkali Gulch Lateral

The Alkali Gulch Lateral would begin at a turnout on the Breen/La Plata Lateral, near Breen, Colorado, and would run due west for approximately 6 miles. This pipeline would provide water along a corridor of scattered rural residential development. The Alkali Gulch Lateral alignment ends about six miles from the western boundary of the Southern Ute Indian Reservation.

The lateral would provide domestic water for a water distribution line in the northwest part of the reservation. In addition, a future potential need for the lateral would be to provide domestic water to the Lewis Mesa area of the Ute Mountain Ute Reservation should the Ute Mountain Ute Tribe develop a visitor center in the Ute Mountain Ute Tribal Park.

o Grass Canyon Lateral

The Grass Canyon Lateral would begin at a turnout on the Breen/La Plata Lateral and would run to the west into the Ute Mountain Ute Reservation. The lateral would end along the Mancos River south of Mesa Verde National Park. The total length of the lateral would be approximately 32 miles.

The turnout to the Grass Canyon Lateral would be along Highway 140, west of Marvel, Colorado. From its beginning, the Grass Canyon Lateral would run due west for about 8 miles, mainly along an existing road alignment. The next eight miles the pipeline would follow a corridor in a southwesterly direction to the county line of La Plata and Montezuma Counties, on an alignment governed by topography and existing unimproved roads.

After crossing into Montezuma County, the pipeline would continue westerly, into the Ute Mountain Ute Reservation to provide water to a potential resort development along the north side of the Mancos River. In Montezuma County, the pipeline would lie mainly along existing roads but also on undisturbed terrain. For most of its length, it would run along Grass Canyon Road, which runs along an east to west oriented mesa paralleling the Colorado/New Mexico state line. The last five to six miles of the pipeline would continue west to the end of the mesa, drop off the mesa, cross the Mancos River, and continue downstream along an existing road to the potential resort area.

In addition to the delivery points cited above, the Grass Canyon Lateral could serve isolated rural residential development en route. The first half of the pipeline would run through rural areas in the Southern Ute Indian Reservation. The second half of the pipeline would run through the Grass Canyon Road corridor of the Ute Mountain Ute Reservation.

o Residential Branch of Grass Canyon Lateral

The Residential Branch would begin along the Grass Canyon Lateral at the boundary between the Colorado Ute Tribal Reservations and run generally to the southeast. The Residential Branch would supply water to a potential Ute Mountain Ute residential development in the Barker Dome area, located five to six miles west of the La Plata River and approximately two miles north of the Colorado/New Mexico state line. The Residential Branch would be about two miles in length. A booster pumping plant could be required along the Residential Branch.

O Gas-Fired Power Plant Lateral

This lateral would begin on the north side of the San Juan River and run north to serve a potential gas-fired power plant in the New Mexico portion of the Ute Mountain Ute Reservation. The potential power plant site would be approximately seven miles north of the San Juan River, at an elevation approximately 420 feet above the level of the river. This location was selected because of its proximity to gas reserves and reservation boundaries. The pipeline would be approximately 8 miles long, and would skirt an existing coal mining development along the north side of the San Juan River. The river diversion would consist of a pumping plant along the San Juan River to lift the water to the elevation of the potential power plant. The diversion point would be about 10 miles west of the Farmington Municipal Airport.

The San Juan River water carries a heavy sediment loading when heavy precipitation occurs in tributary drainage areas. The sediment load presents problems for river diversion systems, particularly pumping plants. Consequently, the facilities to provide water to the gas-fired power plant would require either a pond at the power plant capable of storing several days' water supply, or a desilting pond at the diversion site along the San Juan River.

The water supply for the potential gas-fired power plant would originate in the Animas River, and would flow to the diversion point in New Mexico through the Animas and San Juan Rivers. Depending on runoff conditions and time of year, the water for the gas-fired power plant would be stored in Ridges Basin Reservoir for eventual release back to the Animas when required by the power plant.

O San Juan and Animas Rivers Diversions

Operating within the depletion limits established by the ESA, water could be left in the Animas and San Juan Rivers or released from storage to serve the M&I needs of the ALPWCD service areas in Durango and the SJWC service areas in Aztec, Bloomfield, and Farmington, New Mexico. The lease or sale of M&I water to non-Indian users by the Colorado Ute Tribes could be served by the same means, as is the water from ALP Project which would serve the NNMP users. Water conveyed in either or both of these rivers would be diverted at the point of use, and stored in existing storage facilities (e.g., Farmington Reservoir, Shiprock storage tanks) or in storage facilities constructed for the purpose (e.g., Aztec Reservoir).

2.5.1.6 Land Requirements for Non-Binding Future Water Use

Nearly 2,000 acres of land would be required for construction and operation of the various future water uses that have been identified for ALP Project water by the Colorado Ute Tribes and other project beneficiaries. In addition, there would be an undetermined amount of land involved in an expansion of the existing Southern Ute Indian coal mine, and an unknown amount of acreage required for expansion of municipal water distribution systems. The required acreage for conveyance pipelines, pumping plants, and water treatment plants is not included in this total. Assumptions for land requirements for each of the potential uses is shown in **Table 2-64**.

Table 2-64 Refined Alternative 4 Future Water Uses and Acreage Affected			
Water User	Future Water Use	Size of Development	Land Required (acres)
Southern Ute Indian Tribe	Florida Mesa (Highway 172) Housing	200 housing units at 1,500 square feet (sf) each	50
Southern Ute Indian Tribe	Animas Basin (La Posta) Housing	200 housing units at 1,500 sf each	50
Southern Ute Indian Tribe	La Plata Basin (Red Mesa) Housing	200 housing units at 1,500 sf each	50
Southern Ute Indian Tribe	Animas Industrial Park	500,000-sf light industrial complex	15
Southern Ute Indian Tribe	Ridges Basin Golf Course and Resort	300 room hotel, casino and golf course	220
Southern Ute Indian Tribe	Coal Mine	Unknown	Unknown
Southern Ute Indian Tribe	Coal-Fired Power plant	1000 MW	220
Southern Ute Indian Tribe	Livestock and Wildlife	Small stock ponds or water tanks	10
Ute Mountain Ute Tribe	La Plata Basin (Johnson) Housing	200 housing units at 1,500 sf each	50
Ute Mountain Ute Tribe	Mancos Canyon Golf Course and Resort	300 room hotel and golf course	200
Ute Mountain Ute Tribe	La Plata Basin (Hesperus) Resort and Golf Course	300 room hotel, golf course and dude ranch	350
Ute Mountain Ute Tribe	Gas-Fired Power Plant	500 MW	20
Ute Mountain Ute Tribe	Livestock and Wildlife	Small stock ponds or water tanks	10
Colorado Ute Tribes	Durango - M&I lease/sale	500,000-sf light industrial complex	15
Colorado Ute Tribes	Bloomfield - M&I lease/sale	Public water system	10+
Colorado Ute Tribes	Farmington - M&I lease/sale	Public water system	10+
Colorado Ute Tribes	Florida Mesa - M&I lease/sale	Vacation housing on 35 acre plots	350
Colorado Ute Tribes	Red Mesa Plateau - M&I lease/sale	Residential housing @ 1500 sf each	50
Colorado Ute Tribes	Kirtland - M&I lease/sale	Public water system	10+

Table 2-64 (continued) Refined Alternative 4 Future Water Uses and Acreage Affected			
Water User	Future Water Use	Size of Development	Land Required (acres)
Colorado U te Tribes	Aztec - M&I lease/sale	Residential housing at 2,000 sf each	50
Navajo Nation	Navajo Nation Shiprock Tribal Use	Tribal water supply	100
Animas-La Plata Water Conservancy District	M&I uses	Rural and city water supply	2 @ 10+
San Juan Water Commission	M&I uses	Rural and city water supply	4 @ 10+

2.5.1.6.1 Conveyance Pipelines and Associated Facilities

Conveyance Pipelines

For analysis purposes, the water conveyed any distance from source to use would employ pressurized pipelines instead of open canals. Most conveyance pipelines would vary in size from 4 inches to 24 inches in diameter, and could either be steel or plastic, depending on the size and pressure requirements of the pipeline. (An exception would be the 48-inch Basin Creek discharge conduit of steel or concrete.) A standard 50-foot right-of-way width would be used for construction. Additional temporary work areas would be required at road and canal crossings. Following construction and restoration of the right-of-way and temporary work spaces, a 25 foot-wide permanent right-of-way would be dedicated to each conveyance pipeline. The remainder of the construction right-of-way would be restored to its previous use and condition.

Additional work space for spoil storage, staging, equipment movement, and material stockpiles would be required for construction at the following locations:

- Road and canal crossings
- Side slopes
- Stringing truck turnaround areas
- Wetlands
- Any directionally drilled water bodies

If all the non-binding options were developed, the related construction of conveyance pipelines would impact nearly 800 acres (see **Table 2-65**). In addition to land disturbed by construction along the pipeline rights-of-way, there would be additional acres disturbed by use of extra work space at road crossings and stream/canal crossings. The construction of four or more aboveground pumping stations would affect about 20 acres of land during construction. An undetermined number of acres would also be disturbed by water treatment plant construction and temporary access roads.

Table 2-65 Refined Alternative 4 Acreage Impacted by Construction and Operation of Lateral Pipelines			
Conveyance Pipeline	Length (miles)	Land Required for Construction (acres)	Land Required for Operation (acres)
Florida Mesa	9.3	56	28
Sunnyside	6.7	41	20
Durango M&I	3+	18+	9+
Basin Creek Discharge	3	27	9
Coal Mine/Power Plant	18.8	114	57
Breen/La Plata	24.2	147	74
Alkali Gulch	6.1	37	18
Grass Canyon West	21	127	64
Grass Canyon East	11.4	69	34
Residential Branch	3.8	23	12
Gas-Fired Power Plant	8	48	24
Total	115.3	707	377

Land dedicated as permanent right-of-way if all conveyance pipelines were constructed would be about 400 acres. An additional 10 acres would be required for the operation of the new pumping plants and an additional amount of acres for water treatment plants and the operation of permanent access roads. The permanent right-of-way would be maintained in a cleared, grassy condition or used for agricultural purposes, except as otherwise noted for wetlands, tree screens, etc.

Pumping Plants

Four pumping plants would be required. One would pump water to the Florida Mesa, one would pump water from Ridges Basin Reservoir to serve M&I needs, and another would pump water over the Red Mesa to points south and west. A fourth would be required to pump water to the gas-fired power plant from the San Juan River. The typical pumping plant footprint would measure 15 x 35 feet, and would include a single story building to enclose the pump(s), an electrical power panel, and communications and gauging equipment. The entire facility is enclosed with a security fence, and a permanent access road is maintained to the facility. The land required for construction of the four pumping plants would total about 20 acres for construction and 10 acres for operation.

Water Treatment Plants

At least two water treatment plants would be required, one for treatment of Florida Mesa M&I water, and another for the M&I water used west of Ridges Basin. In addition, water used for M&I uses on the Animas and San Juan Rivers would require treatment, but for the purposes of completing this analysis the existing municipal water treatment facilities would be used. The size of the typical water treatment plant would vary depending on capacity. The overall land requirements are expected to be less than 20 acres total.

2.5.1.6.2 Construction Procedures and Impacts

This section describes the general procedures that a lead agency would follow for construction of the steel or plastic pressurized conveyance pipelines, pumping plants, and water treatment plants that would be built to support future water use options that are implemented. When sensitive areas are crossed, special construction procedures would be employed and these are also described in this section.

Pipeline Construction Procedures and Impacts

Pipeline construction proceeds in the manner of an outdoor assembly line composed of specific specialized activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way, clearing and grading, trenching, pipe stringing, bending, welding, lower-in, backfill, and cleanup. Prior to the start of construction, the lead agency would attempt to finalize surveys of centerlines and construction workspace, and then complete land or easement acquisition. For analysis purposes, the necessary land or easements would be obtained through good faith negotiations with landowners, on a willing buyer/willing seller basis, and that condemnation would not be used.

The first phase of actual construction would involve staking the pipeline centerline, construction right-of-way, and extra temporary work space, and installing temporary gates at each fence crossing. The right-of-way would then be cleared through forested areas and graded where necessary to create a level work surface. Topsoil would be stripped and segregated in agricultural and residential areas. The individual sections of pipe would be laid along the right-of-way (pipe stringing). Stringing can be conducted either before or after trenching. Trenching would be accomplished using a rotary ditching machine or backhoe. Where topsoil has been stripped, trench spoil would be maintained separate from topsoil. The trench would be dug deep enough to allow for at least three feet of cover in standard conditions.

If bedrock that cannot be loosened by mechanical ripping is encountered during trenching, blasting may be required to loosen rock. If blasting is required, applicable federal, state, and local regulations would be observed, and necessary permits and authorizations would be obtained. Federal blasting regulations are issued by the U.S. Bureau of Alcohol, Tobacco and Firearms (27 CFR 55), and U.S. Department of Labor, Occupational Safety and Health Administration (OSHA)(29 CFR 1910.109-1926.914). In the event that blasting is necessary, strict requirements to control energy releases would be followed, and proper safeguards would be in place to protect persons and property in the area.

After trenching and pipe stringing, if the pipeline is steel, individual sections of pipe would be bent where necessary to fit the contours of the trench, placed on temporary supports along the edge of the trench, aligned, and welded together. All welds would be visually and radiographically inspected and repaired if necessary. The welds would be coated with a protective coating (epoxy) to protect against

corrosion, which would supplement the factory-applied coating of the entire pipe. The pipeline coating would be inspected to locate and repair any faults or voids. If the pipeline is made of plastic, then sections would be joined using appropriate techniques, with inspection for voids. The pipe assembly would then be lowered into the trench by sideboom tractors and the trench backfilled with previously excavated soil using bladed equipment or backhoes.

After the trench is backfilled, the pipeline would be hydrostatically tested in accordance with Department of Transportation Regulations (49 CFR 192) and company specifications to ensure that the pipeline is capable of operating at the design pressure. Test segment locations and lengths would be determined by topography and water availability. Test water would be obtained from municipal supplies or nearby surface waters in accordance with necessary permits and approvals. Test water would be pumped into each test section, pressurized to design test pressure, and maintained at that pressure for eight hours. Any leaks detected during testing would be repaired, and the pipeline would be retested until the specifications are met. After testing a segment, the water may be either pumped into the next segment for testing or discharged onto land in well-vegetated upland areas. Test water would be in contact with only new pipeline, and no chemicals would be added. Precautions would be taken during discharge to minimize erosion, and all discharge would be in accordance with applicable permits and approvals.

Following backfilling and hydrostatic testing, or concurrently with hydrostatic testing, all work areas would be final graded and restored. Where necessary in agricultural and residential lands, the subsoil would be plowed to alleviate compaction, and the topsoil returned to its original horizon. Land contours would be restored to as near original conditions as possible in all areas. In non-agricultural lands, permanent erosion control berms (waterbars or slope breakers) would be installed on slopes. The surface would be prepared for seeding, treated with soil amendments, and planted with a seed mix based on consultation with local authorities and respective landowners. Cultivated agricultural lands would not be seeded unless requested by the landowner. Surplus construction material and debris would be removed and disposed of in appropriate facilities, and private property such as fences, gates, driveways, and lanes would be restored to a condition equal to or better than the preconstruction condition. Pipeline markers would be installed at fence lines, river crossings, road crossings, and other locations. The markers would identify the pipeline operator and display telephone numbers for emergencies or general inquiries.

Pipeline construction involves loss of vegetation and wildlife habitat, exposes soil to wind and water erosion, compacts soil, and can mix topsoil with subsoil horizons. Where pipelines cross canals, streams, or rivers, there is the potential for impacts to riparian vegetation, sediment releases into streams, and bank erosion. Pipelines in canyons or gulches subject to seasonal high water runoff are subject to erosion and loss of cover.

Pipeline Construction Techniques for Sensitive Areas

In agricultural areas where subsurface drainage systems would be crossed, the lead agency would attempt to locate and mark all tiles before trenching. All tiles cut during trenching would be marked. Drainage flows across the trench would be maintained during construction, and all damaged tiles would be repaired to their original or better condition or, if necessary, replaced by specialized drain tile installation contractors.

Construction across rivers, streams, canals, and drainages would be accomplished by either trenching across the waterbody (open-cut crossing, plowing-in, flume crossing, dam and pump crossing) or directionally drilling underneath the waterbody. All stream-crossing methods typically would require extra temporary workspace on both sides of the crossing. Excavation, pipeline installation, and

backfilling across the waterbody and banks are usually completed as quickly as possible. There are several options available in crossing a stream channel. These include:

- Open-cut crossing method
- Plowing-in method
- Dry flume crossing method
- Dam and pump crossing method
- Directional drilling

Open-cut Crossing Method

An open-cut crossing would be accomplished by using conventional bucket-type excavation equipment operating from the banks, or from within the waterbody depending on the width at the crossing point. For an open-cut crossing, the lead agency would cut a trench and install the pipe in the flowing stream.

Plowing-In Crossing Method

For shallow streams with sandy or loose substrate, a pilot cut is made using a breaker plow pulled by a bulldozer. A second pass is made, pulling the assembled pipeline attached to the plow. This method of crossing minimizes the sediment released from the trench excavation in the open-cut method, and is relatively quick and efficient.

Dry Flume Crossing Method

A dry flume crossing involves the use of flume pipes to separate the water from its banks in order to cross the waterbody during dry conditions, while maintaining the flow of water downstream. The trench excavation is carried out under the flume pipes using backhoes from each side of the stream and the pipeline would be installed without equipment entering the flowing stream.

Dam and Pump Crossing Method

The dam and pump crossing method involves the construction of temporary dams constructed of sandbags both upstream and downstream of the proposed ditch. Pumps are set up at the upstream dam with the discharge line routed through the construction area, discharging the water immediately downstream of the downstream dam. Water flow would be maintained through all but a short reach of the river at the actual crossing. The pipeline would be installed in the isolated area between the dams.

Directional Drilling Method

Directional drilling is generally proposed where conditions in the stream (such as contaminated sediments) or the waterbody's environmental sensitivity make the open-cut method undesirable or impractical. Directional drilling starts by drilling a pilot hole beneath the waterbody to the opposite bank. After the pilot hole is enlarged to the correct diameter, a prefabricated pipe segment is pulled through to complete the crossing. Directional drilling would require extra temporary work space on both sides of the crossing, typically set back at least 100 feet from the waterbody.

Construction within residential areas or in close proximity to homes may require special construction techniques, such as the drag section technique, due to limited workspace and to minimize disturbance to

residents. The lead agency would implement special construction measures where occupied residences are within 50 feet of any construction work area .

Pumping Plant and Water Treatment Plant Construction Procedures and Impacts

Construction of the new pumping and water treatment plants would first require site clearing, and then grading to establish appropriate contours for building construction. Following site preparation, utilities and building foundations would be installed, and the buildings erected. Equipment would then be installed and tested. The plant would be tied into the pipeline system and the site would be cleaned up, landscaped, and fenced, as appropriate. There would be impacts to site vegetation and wildlife, soils would be disturbed and subject to wind and water erosion, land use would change, and there would be noise increases with the operation of the pumping plants.

Operation and Maintenance Procedures and Impacts

The lead agency would conduct ground inspection of the pipelines, pumping plants and water treatment plants on a regular basis for evidence of excavation activity on or near the right-of-way by landowners or other parties, erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices, exposed pipe, and other potential problems that may affect the safety and operation of the pipeline. In addition, pipeline markers and signs would be inspected, and maintained or replaced, as necessary. Repairs to the right-of-way could include regrading and reseeding with appropriate plant materials or installing other soil stabilization measures.

The pumping plants and water treatment plants would be designed for remote operation (unstaffed). However, one to three personnel may be assigned to the conveyance system on a full-time basis for maintenance. Various routine maintenance and operations procedures would be followed, such as calibration, maintenance, and inspection of equipment as well as the monitoring of pressure, temperature, and vibration data. Maintenance personnel would visit these facilities regularly.

In upland areas, a 25-foot-wide permanent pipeline right-of-way would be maintained in a grassy or early successional stage. Vegetation in these segments of the right-of-way would be cut no more frequently than once every three years. However, where needed to facilitate periodic surveys to detect leaks, a 10-foot-wide strip centered over the pipeline would be maintained annually in an herbaceous state. If needed, herbicides would be applied in compliance with applicable laws and regulations. Routine vegetation maintenance of the pipeline right-of-way would not occur between April 15 and August 1 of any given year. In agricultural, open, and residential areas, landowners would be allowed to continue preconstruction land uses. The erection of permanent structures within the permanent right-of-way, however, would not be allowed.

At waterbodies, a 25-foot-wide riparian strip (measured from the mean high water mark) would be allowed to revert to native vegetation. However, in riparian areas as well as in wetlands, a 10-foot-wide strip centered over the pipeline would be maintained in an herbaceous state to facilitate corrosion and leak surveys. In addition, trees 15 feet or more in height would be selectively removed from a zone within 15 feet of the pipeline. No herbicides would be used within 100 feet of a wetland or waterbody except as specified by the appropriate land management or state agency.

The pumping plants and treatment plants would require little vegetative maintenance because they would generally be covered with gravel. However, vegetation growing up through the gravel within the fence aboveground facility sites may be controlled with herbicides.

2.5.2 Refined Alternative 6

Refined Alternative 6 proposes that water rights under the Settlement Act for the Colorado Ute Tribe's be obtained through augmentation and the coordinated operation of existing federal projects in the area proximal to the Tribes Reservations and through purchase of irrigated agricultural lands and associated water rights, or a combination of both. Refined Alternative 6 has been modified to the equivalency of the depletion amounts in Refined Alternative 4 in order to analyze both alternatives on a commensurate or equivalent basis. Like Refined Alternative 4, Refined Alternative 6 also consists of two components:

- One component would be equivalent to the structural component of Refined Alternative 4 by developing up to 57,100 afy of depletions in the San Juan Basin and serving the same M&I needs as served by Refined Alternative 4 with one exception. Instead of serving the Red Mesa regional demand of 2,102 afy, Refined Alternative 6 would serve a corresponding demand in the Montezuma County area.
- A second component for Refined Alternative 6 was developed under the assumption that the water could be acquired to develop an equal amount of depletions of 13,000 afy and in a manner similar to Refined Alternative 4 by purchasing agricultural lands and associated water rights.

Sources of water for Refined Alternative 6 include: the purchase of stored water from Red Mesa Reservoir, the coordinated operation of existing reservoirs with streamflows in the San Juan River Basin for more efficient utilization of water supplies, and the raising of Lemon Dam. Other elements of Refined Alternative 6 include: the NNMP and measures to avoid impacting wetlands from purchase of water and transferring to M&I use. These latter two elements are discussed in Section 2.5.2.4.

2.5.2.1 Water Supply for Refined Alternative 6

2.5.2.1.1 Sources and Amount of Water Supply

The amount of water potentially available is shown in **Table 2-66**.

2.5.2.1.2 Depletion of San Juan River Water Supply

Table 2-67 lists the various uses and the average diversion and depletion for Refined Alternative 6. The depletions listed are the cumulative depletions of all uses. The measurement point for the depletions is the San Juan River at Four Corners, New Mexico.

Table 2-66 Refined Alternative 6 Summary of Sources and Amounts of Water	
Water Source	Average Depletion Amount (afy)
Water Depletions for Refined Alternative 6 Equivalent to Structural Component of Refined Alternative 4	
Water depletions obtained from purchase of 11,933 acres	
" Purchase 10,000 acres in Pine River Basin	15,114
" Purchase 785 acres in La Plata River Basin	521
" Purchase 500 acres in Mancos River Basin	761
" Purchase 648 acres in McElmo Creek Basin	1,036
Enlarge Lemon Dam	500
Coordinated operation of existing reservoirs with streamflows in the San Juan River Basin for more efficient utilization of the water supplies	36,891
Purchase of 200af of stored water in Red Mesa Reservoir	42
Total Water Depletions Equivalent to Structural Component of Refined Alternative 4	54,865^a
Water supply that could be acquired through purchase of irrigated lands. (This with a \$40,000,000 water acquisition fund. (This amount of water is equivalent to the non-structural component of Refined Alternative 4.)	
Purchase 4,643 acres in Animas/Florida River Basins.	6,500
Purchase 4,062 acres in McElmo Creek Basin.	6,500
Total depletions acquired under this component of Refined Alternative 6	13,000^b
Total Water Depletions	67,865^c
^a This 54,865 afy is equivalent to the 57,100 afy and 2,235 afy less than Refined Alternative 4 due to a reduction in evaporation losses. ^b This 13,000 afy is equivalent to the non-structural component of Refined Alternative 4 and is a depletion that has occurred historically. This is not a new depletion to the San Juan River Basin. ^c Of the 67,865 afy depletion, approximately 37,433 afy is a new depletion and 30,932 afy is a depletion that has occurred historically.	

Table 2-67 Modeled Diversion and Depletion Summary for Refined Alternative 6 M&I Use at 50 Percent Efficiency				
Category	Diversion (afy)	Depletion (afy)	Diversion Location	Return Flow Location
Southern Ute Indian Tribe - On-Reservation Non-Binding Uses				
Florida Mesa Housing	140	70	Florida River	Florida River at Confluence
Animas River Basin Housing	140	70	Animas River	Animas River at Florida Confluence
La Plata River Basin Housing	140	70	La Plata River at Cherry Creek	La Plata River below Cherry Creek
Animas Industrial Park M&I	40	20	Animas River	Animas River at Florida Confluence
Ridges Basin Golf Course	796	398	Animas River	Animas River at Florida Confluence
Ridges Basin Resort	44	22	Animas River	Animas River at Florida Confluence
Coal Mine	830	415	San Juan River below Animas River	San Juan River above Shiprock
Coal-Fired Power Plant	27,000	13,500	San Juan River below Animas River	San Juan River above Shiprock
Livestock and Wildlife	30	15	La Plata River	La Plata River at state line
Southern Ute Indian Tribe Total	29,160	14,580		
Ute Mountain Ute Tribe On-Reservation Non-Binding Uses				
La Plata Housing	280	140	La Plata River at Cherry Creel	La Plata River below Cherry Creek
Mancos Canyon Golf Course	978	489	Mancos River	Mancos River
Mancos Canyon Resort	33	17	Mancos River	Mancos River
Gas-Fired Power Plant	4,600	2,300	San Juan River at San Juan Power Plant Diversion	San Juan River above Shiprock
Livestock and Wildlife	40	20	La Plata River at Cherry Creek	La Plata River below Cherry Creek
La Plata Basin Golf Course	626	313	La Plata River at Cherry Creek	La Plata River below Cherry Creek
La Plata Basin Dude Ranch	10	5	La Plata River at Cherry Creek	La Plata River below Cherry Creek
Ute Mountain Ute Tribe Total	6,597	3,299		

Table 2-67 (continued)				
Modeled Diversion and Depletion Summary for Refined Alternative 6				
M&I Use at 50 Percent Efficiency				
Category	Diversion (afy)	Depletion (afy)	Diversion Location	Return Flow Location
Colorado Ute Tribes Combined Non-Binding Regional Water Supply				
Durango	10,138	5,069	Animas, Florida	Animas River below pump
Farmington	17,608	8,804	Animas or San Juan	San Juan below Animas Confluence
Florida Mesa	7,016	3,508	Florida	Animas at Florida Confluence
Montezuma County	2,102	1,051	Dolores (rights conv)	McElmo Creek
Kirtland, New Mexico	5,018	2,509	San Juan below Animas	San Juan above Shiprock
Aztec, New Mexico	1,410	705	Animas or San Juan	Animas R. at Farmington
Total Regional Water Supply	43,292	21,646		
Southern Ute Indian Tribe Non-Structural				
Florida River, Animas River - Agricultural, Future Conversion	13,000	6,500 ^a	Florida, Animas left on land	
Ute Mountain Ute non-structural				
Dolores River - Agricultural, Future Conversion	13,000	6,500 ^a	Dolores - Montezuma Valley left on land	
Total Colorado Ute Tribes Settlement	105,049	52,525		
Other Uses				
San Juan Water Commission				
Bloomfield and Upstream Uses	4,533	2,267	San Juan-Citizen s Ditch	San Juan River at Farmington
Farmington and Flora Vista	10,767	5,383	Animas River or San Juan River	San Juan River below Animas Confluence.
Aztec	3,502	1,751	Animas River or San Juan River	Animas River at Farmington
Kirtland	1,998	999	San Juan River below Animas River	San Juan River above Shiprock
Total SJWC	20,800	10,400		
Navajo Nation	4,680	2,340	Farmington M&I Diversion	Shiprock below Gage
ALPWCD	5,200	2,600	Animas, Florida Rivers	Animas below Durango Pumping Plant

Table 2-67 (continued)				
Modeled Diversion and Depletion Summary for Refined Alternative 6				
M&I Use at 50 Percent Efficiency				
Category	Diversion (afy)	Depletion (afy)	Diversion Location	Return Flow Location
Total Other Uses	30,680	15,340		
Total Water Use	135,729	67,865	Note: The 67,865 includes 30,932 afy of depletion that would represent historical depletions. New depletions would be 37,433 afy which is within the 57,100 afy depletion allowed to meet flow recommendations for the SJRBRIP.	
aThis location for modeling convenience. For all other purposes, assume return flow at the Colorado/New Mexico state line.				

2.5.2.2 Development of Component of Refined Alternative 6 Commensurate with Refined Alternative 4 for Developing up to 57,100 afy of Depletions to Serve M&I Needs

Analysis of water from various sources included:

- o Purchase of land and water rights;
- o Coordinated operation of existing storage reservoirs with streamflows for more efficient utilization of water supplies;
- o Purchase of storage space in existing non-federal facilities; and
- o Raising of Lemon Dam.

2.5.2.2.1 *Purchase of Land and Water Rights to Yield 17,432 afy of Depletions*

Land (11,933 acres) and associated water rights would be purchased in the Pine, La Plata, and Mancos River and McElmo Creek Basins to supply a yield of 17,432 afy of historical depletions. This does not include the land required to supply the 13,000 afy depletion discussed under Section 2.5.2.4.

Pine River Basin

A total of 10,000 acres of non-Colorado Ute irrigated land would be purchased in the Pine River Basin. The associated 15,114 af of average annual depletion would be removed from the land and allowed to flow into Navajo Reservoir under the same delivery pattern that would have occurred to the irrigated land. This would become project water with the delivery point at Navajo Reservoir for purposes of administering the purchased water rights in the Pine River.

La Plata Basin

To meet the demands not met by available streamflow, a total of 785 acres of irrigated land would be purchased and the associated average annual depletion of 521 af transferred to M&I use.

Mancos Basin

To meet the demands not met by available streamflow, a total of 500 acres of irrigated land would be purchased and the associated average annual depletion of 761 af transferred to M&I use.

McElmo Creek (Montezuma County)

A total of 648 acres, sufficient to provide a firm yield depletion of 1,036 afy, would be purchased and the water transferred to M&I use to satisfy regional demand in Montezuma County. All water resulting from these purchases from McElmo Creek would be for the benefit of the Ute Mountain Ute Tribe.

2.5.2.2.2 Coordinated Operation of Existing Storage Reservoirs with Streamflows for Increased Availability of Water under Refined Alternative 6

Several federal storage facilities were evaluated for coordinated operation with streamflows in the San Juan River Basin for more efficient utilization of water supplies. The water amounts present in Table 2-66 should be viewed as preliminary and would need to be verified with subsequent computer modeling studies.

Navajo Reservoir

Navajo Reservoir would be operated to supplement available Animas River flows in meeting the SJWC and Navajo Nation demands; the Farmington, Aztec and Kirtland regional water demands, and the demands for the non-binding uses at the coal mine, coal-fired power plant and gas-fired power plant for the Colorado Ute Tribes. To the extent that capacity is not sufficient, additional irrigated acreage could be purchased and retired above the reservoir to augment the water supply.

Vallecito Reservoir

Vallecito Reservoir would operate as it has historically been operated, storing water to deliver any water transferred from irrigation to M&I use in the same pattern as for irrigation. There would be no additional yield from the reservoir. The reservoir would provide the storage required to deliver water on an M&I delivery pattern.

Jackson Gulch Reservoir

Jackson Gulch Reservoir would be operated to store agricultural water purchased for conversion to M&I and release according to demand as long as such operation did not impact the delivery of agricultural water to existing right holders.

In summary, approximately 36,891 af may be available through coordinated operation of Navajo Reservoir with streamflows in the San Juan River for more efficient utilization of water supplies. This should be considered as a preliminary number and will be revised through subsequent re-evaluation. This would need to be verified with subsequent computer modeling.

2.5.2.2.3 *Purchase of Storage Space in Red Mesa Reservoir*

Approximately 200 af of space would be purchased in Red Mesa Reservoir to store water acquired from purpose of irrigated lands.

2.5.2.2.4 *Enlarging Lemon Reservoir*

The capacity of Lemon Reservoir would be increased from approximately 40,000 af to 50,000 af by raising the dam 11.5 feet. The increased capacity would be used to deliver water to the Florida Mesa Housing Unit and supplement Animas River diversions to meet the City of Durango demands and the Durango regional demands. The average annual depletion supplied by Lemon Reservoir to these uses is about 500 af, ranging from zero to 2,500 af per year. More detailed water operation modeling studies would need to be completed to verify the yield from enlarging Lemon Reservoir.

Dam Configuration

Lemon Dam is a zoned earth and rock fill dam with a height of 215 feet above the streambed of the Florida River. The crest at elevation 8,167 feet is 30 feet wide and 1,360 feet long. The upstream slope is 2.5:1. Raising the dam involves increasing the height and thickness of the impervious zone near the dam crest and increasing the embankment on the downstream slope to support the added height.

There is a landslide upstream of the spillway approach channel that has been monitored for several years. Although it poses no threat to the subsurface intake of the outlet works or to the reservoir, it is planned to remove earth from the upper portion of the slide and render it more stable. This would be carried out as part of the dam height augmentation.

Spillway Requirements

In increasing the height of Lemon Dam to increase storage, the deficient capacity of the spillway must also be corrected. Reclamation studies indicate that the existing spillway cannot safely pass the Probable Maximum Flood (PMF) with three feet of free board. To estimate the scope of construction required, a spillway configuration was developed at the conceptual level that could safely pass the PMF with the increased height of the dam.

Flood routings were performed for several alternative spillway configurations with the U.S. Army Corps of Engineers (Corps) HEC-1 Flood Hydrograph Package. Alternative widths of uncontrolled spillways with crest elevations at the maximum normal pool level required widening the existing spillway or adding a new left abutment spillway. The gated spillway alternatives either added gates on the existing spillway crest or added gates to a widened spillway crest. Different dam crest raises are involved.

Selected Spillway Concept and Dam Height Increase

The 54-foot-wide gated spillway was selected as the alternative that would require the least disruptive construction. It results in about the same dam crest level as a 200-foot uncontrolled crest alternative. To safely pass the PMF and contain 10,000 af additional storage, the dam crest level would be raised by about 11.5 feet above the existing crest.

Construction

Two tainter gates, each 27 feet wide by 20 feet high, would be added to the existing spillway crest along with a central pier to support the gates. The spillway walls in the vicinity of the gates would be demolished and rebuilt to a higher level with additional structural support for the gates. The remainder of the spillway chute and stilling basin walls would be raised by approximately 10 feet.

Augmentation of the downstream slope involves adding about 52 feet, measured horizontally, to the width of the dam to maintain the 2:1 slope from the raised crest. At the base of the dam, 45,000 cubic yards would be excavated to reach a foundation for the downstream fill. A total of approximately 650,000 cubic yards of fill materials are needed to complete the increased height of the dam. Sources of fill materials are the excavated material and borrow areas that would be developed on private lands either upstream of the existing reservoir or downstream from the dam. Haul distances are on the order of five miles and highway type vehicles would be required.

Construction could be completed in three years with a normal weather pattern. Spillway gates would be fabricated early in the year and spillway field construction would start after the first year overflow period and be completed during the year. Earthwork would start early the first year and finish late the third year, taking advantage of the normal low reservoir level in the fall for the crest area rework.

Construction Cost

The estimated construction cost for raising Lemon Dam to gain an additional 10,000 af of capacity would be approximately \$28 million. This represents a high cost for the additional water yield from the reservoir.

2.5.2.3 Development of Component of Refined Alternative 6 to Purchase Land and Water Rights for 13,000 af of Depletion (Commensurate with the Non-Structural Component of Refined Alternative 4)

2.5.2.3.1 Purchase of Land and Water Rights in Animas and Florida River Basins

Acreage sufficient to provide a firm yield depletion of 6,500 af would be purchased in the Animas and Florida Basins as an equivalent to the non-structural component of Refined Alternative 4. The water would remain on the land as described in Refined Alternative 4. With a depletion factor of 1.4 af per acre, 4,643 acres would be required.

2.5.2.3.2 Purchase of Land and Water Rights in McElmo Creek (Montezuma County)

Approximately 4,062 acres, an amount sufficient to provide a firm yield depletion of 6,500 af would be purchased in the Montezuma Valley, either within the Montezuma Valley District or elsewhere in the Dolores Project service area as an equivalent to the non-structural component of Refined Alternative 4. The water would remain on the land.

2.5.2.4 Other Elements of Refined Alternative 6

2.5.2.4.1 Navajo Nation Municipal Pipeline

The NNMP described as part of Refined Alternative 4 would be a component of this Alternative as well. See Section 2.5.1.3.3 for a detailed description of the NNMP.

2.5.2.4.2 Design for Avoidance of Wetland Impacts

When water is transferred off irrigated land, the wetlands associated with the water losses from those irrigated lands would lose their water supply and cease to be wetlands. A portion of those wetlands impacted could be avoided if a water source remains available for the affected wetlands. This could be accomplished by leaving a portion of the water supply at the turnout for the parcel and routing the volume of water that would normally supply wetlands through the parcel and to the associated wetlands. It was assumed that the average acquired parcel is 40 acres and that 2,000 lineal feet of earth ditch would be required to accomplish the delivery for each parcel. With design, permitting, structures, earthwork and contingency, it is estimated that the cost of installing these impact avoidance features would average \$350 per acquired acre. The capital cost for each basin is shown in **Table 2-68**.

Table 2-68 Refined Alternative 6 Summary of Wetland Impact Avoidance Assumptions and Costs				
Category	Pine River Basin	La Plata River Basin	Mancos River Basin	Total
Acquired Acres	10,000	785	500	11,285
Capital Cost for Wetlands Avoidance	\$3,500,000	\$274,750	\$175,000	\$3,949,750
Annual Cost for Operation and Maintenance	\$ 600,000	\$ 47,100	\$ 30,000	\$ 677,100

To assure that water continues to flow to the affected wetlands, annual operation and maintenance would be required. It was assumed that the original cost of water delivery to the parcels would be maintained to avoid negative economic impacts to other water right owners in the basin. For estimating purposes it was assumed that this would average \$15 per acre. In addition, annual maintenance of facilities was assumed to average 10 percent of the capital cost and sufficient labor to assure that the water is delivered regularly would be required. The unit cost of operation and maintenance was estimated at \$60 per acre. The operational cost for each basin is shown in Table 2-68 for the acreage acquired.

Not all of the wetlands affected can be avoided in this manner. When water is transferred from irrigated land, a change in the regional water table occurs. Some of the lands may be adjacent to the parcel, especially those associated with surface runoff, but other wetlands may be somewhat remotely located and the replaced water supply would not be accessible. Although a detailed study has not been completed to understand the hydrology in each of these basins, it is estimated that about 50 percent of the wetland impacts could be avoided in this manner.

From a water balance standpoint, the water requirements associated with the wetlands would cause no new depletion in the basin, requiring no additional water supply and allowing all the depletions associated with the irrigated acreage to be transferred to M&I use as proposed. While transfers of small amounts of water from agriculture to wetlands have occurred within the State of Colorado, no large transfers are known, especially in Water Division 7. The process of quantifying the water available for transfer, that required by the wetlands, and that consumed by associated wetlands prior to transfer, would be rigorous and time consuming. Proving that such transfers would not injure other water right holders will add to the difficulty of the analysis. In the end, the amount of wetlands impact avoidance and mitigation allowed by the state for any given water basin could be limited. This could be particularly critical in the Pine River Basin, where such a large transfer is necessary and may infringe upon the practicability of the avoidance and mitigation measures.

2.5.2.5 Cost and Time Frame for Implementation of Refined Alternative 6

2.5.2.5.1 Cost for Refined Alternative 6

The implementation costs of Refined Alternative 6 include purchase of irrigated land, cost to transfer water rights, structural components, and measures to avoid or mitigate impacts to wetlands. As shown in **Table 2-69**, the land acquisition cost is the largest cost component of the alternative. For Refined Alternative 6, the land required to be purchased would require \$195 million to fund the future land acquisition. The land acquisition would take place over a 30-year period. This longer time frame is required because of the large purchase of 10,000 acres in the Pine River Basin.

Table 2-69 Capital Costs Refined Alternative 6 (Estimated Cost in Million of Dollars)	
Item	Cost
Purchase 20,638 acres of land to yield 30,432 afy of depletions	\$195 million
Engineering, Hydrology and Legal work to Obtain Water Rights.	\$10 million
Purchase of 200 af of storage space in Red Mesa Reservoir (\$5000 per af)	\$ 1 million
Enlarge Lemon Dam and Reservoir	\$28 million
Navajo Nation Municipal Pipeline	\$24 million
Wetland Mitigation	\$10 million
Cultural Resources	\$ 1 million
Costs for Avoidance of Wetland Impacts	\$ 4 million
Total Capital Cost of Refined Alternative 6	\$273 million

2.5.2.5.2 Time Frame for Implementation of Refined Alternative 6

The implementation program for Refined Alternative 6 would span a period of 30 years. As shown on **Figure 2-4**, the structural components of Refined Alternative 6 would be constructed within the first 3 years. However the land acquisition program would need to be conducted over a 30-year period to allow time for the land acquisition consisting of 20,638 acres for the project. The length of the acquisition program would also extend the programs of wetlands impact avoidance and mitigation, cultural resources, and administrative procedures including conversion of water rights from irrigation to M&I use.

2.5.2.6 Conveyance Options to Deliver Municipal and Industrial Water to Future End Uses

Map 2-10 shows the location of water conveyance corridors for Refined Alternative 6.

o Lemon Reservoir Lateral

Durango regional demand, Animas Industrial Park, and Animas housing needs would be met by pumping from the Animas River, supplementing the supply from Lemon Reservoir. The Lemon Reservoir Lateral would deliver water to these areas.

Water from Lemon Reservoir would be delivered to the proposed Horse Gulch Reservoir by means of a pipeline from Lemon Reservoir running downstream along the Florida River to the eastern extension of Horse Gulch, and then running west to the upper end of Horse Gulch. Water from Horse Gulch Reservoir would be available for the City of Durango and for Durango area regional demand.

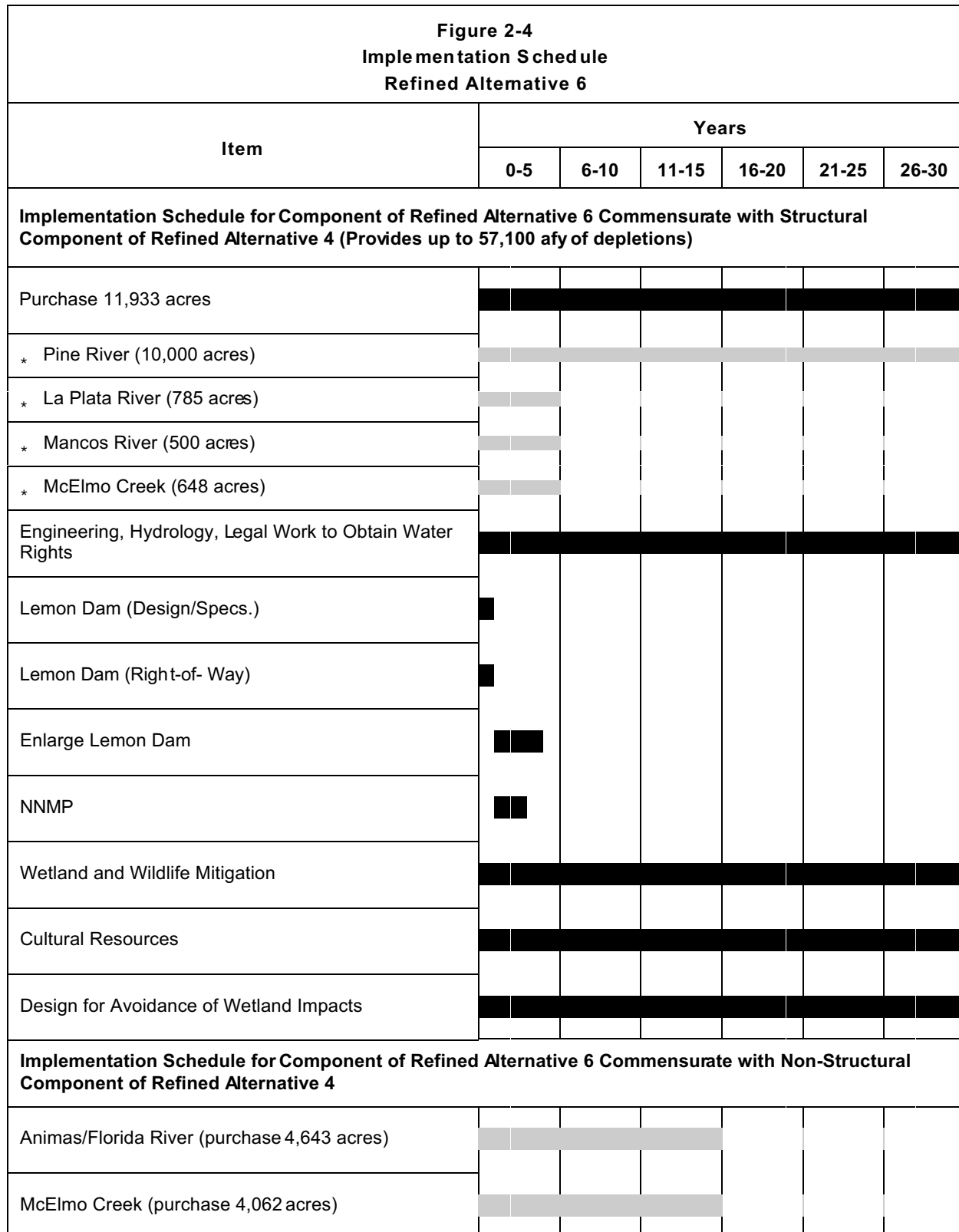
o Florida Mesa Housing Lateral

Florida Mesa Housing would be delivered through: (1) the pipeline from Lemon Reservoir along the Florida River to Horse Gulch (described above), as far as the eastern extension of Horse Gulch, and (2) a branch pipeline running south from the eastern extension of Horse Gulch to the potential housing area. A water treatment plant could be located at the beginning of the branch pipeline.

o Ridges Basin Lateral

This pipeline would deliver water to the Ridges Basin golf course and resort recreation development. The pumping plant would be positioned on the west side of the Animas River, opposite the U.S. 160/550 junction. This is the place where the non-binding conveyance corridor from Ridges Basin Reservoir to Florida Mesa in Refined Alternative 4 would cross the Animas River.

Another option to pump water from the Animas River would be to expand the City of Durango's pumping plant on the east side of the Animas River, across the river from the proposed Durango Pumping Plant in Refined Alternative 4. If this were done, the water for Ridges Basin Reservoir and for the industrial park would need to be piped under the Animas River and then downstream to the point of departure for Ridges Basin.



Insert Map 2-10 Potential Water Conveyance Routes for Non-Binding Tribal M&I End
Uses Under Refined Alternative 6

[back page of map 2-10]

A treatment plant would be needed, which could be located in the Animas River Valley near the pumping plant.

o Sunnyside Lateral

This pipeline would begin on the Ridges Basin Lateral and run south along the Animas River, as described above under Refined Alternative 4.

o Ute Ranch Lateral

The water supply for La Plata River housing, dude ranch, and the resort and golf course would be stored in Red Mesa Reservoir. The water would be pumped from the La Plata River below the Cherry Creek confluence, and piped to Red Mesa Reservoir. From Red Mesa Reservoir, water for the dude ranch and resort and golf course would be pumped from Red Mesa Reservoir and piped northward, partly along Highway 140. The pipeline would end along Highway 140 about 2.5 miles south of Highway 160, at approximately the southwest corner of Section 25, which is on the west edge of the resort and golf course development area. The dude ranch, potentially in Section 29 to the west, would be served by a smaller pipeline heading west for 3.5 miles from the resort and golf course. A treatment plant would be needed north of Red Mesa Reservoir.

o Ute Residential Lateral

The residential development in the southwest corner of the La Plata River Basin would be served by a pipeline heading west from the pumping plant on the La Plata River below the Cherry Creek confluence. That pipeline would follow the same alignment used in Refined Alternative 4. A treatment plant would be needed, which could be constructed along the La Plata River.

o Power Plant Lateral

A single pipeline would serve the gas-fired power plant, the coal mine, and the associated coal-fired power plant. The diversion point would be on the San Juan River, the same as for Refined Alternative 4. However, the 7.6-mile pipeline would be enlarged and extended up into Colorado to serve the coal mine and power plant.

From the gas-fired power plant the alignment would run eastward until it approaches the La Plata River, and then bend northward and ultimately run along New Mexico Highway 170 to the state line. At the state line, the alignment would turn to the northeast and head toward the potential coal-fired power plant site. The pipeline extension from the gas-fired power plant to the coal-fired power plant would be approximately 24.2 miles.

The static pump lift from the San Juan River to the potential coal-fired power plant would be approximately 1,140 feet. A relift pumping plant could be located in the vicinity of La Plata, New Mexico.

The community of La Plata could be served by a one-mile spur line. A treatment plant would be needed if the water were used for culinary use.

O Mancos Canyon Lateral

A direct diversion on the Mancos River for the golf course and resort with pumping plant, treatment plant, and pipeline would be required.

O Farmington, Aztec and Kirtland Regional M&I Demands

The Farmington, Aztec and Kirtland regional M&I demands would be met from the existing systems, with expansion. Diversion locations would require modification to allow a larger supply from the San Juan River. In the case of Aztec, a new pipeline from the San Juan River would be required.

2.5.2.7 Land Requirements for Future Water Uses

Please refer to the discussion of land requirements for future water end uses as described in Section 2.5.1.6 for Refined Alternative 4.

2.5.2.7.1 Conveyance Pipelines and Associated Facilities

For analysis purposes, water conveyed any distance from source to use would employ pressurized pipelines vs. open canals. Most conveyance pipelines would vary in size from 4 inches to 24 inches in diameter, and could either be steel or plastic, depending on the size and pressure requirements of the pipeline. A standard 50-foot right-of-way width would be used for construction. Additional temporary work areas would be required at road and canal crossings. Following construction and restoration of the right-of-way and temporary workspaces, a 25-foot-wide permanent right-of-way would be dedicated to each conveyance pipeline. The remainder of the construction right-of-way would be restored to its previous use and condition.

Additional workspace for spoil storage, staging, equipment movement, and material stockpiles would be required for construction at the following locations:

- Road and canal crossings
- Side slopes
- Stringing truck turnaround areas
- Wetlands
- Any directionally drilled waterbodies.

If all the non-binding options were developed, the related construction of conveyance pipelines would impact nearly 550 acres (see **Table 2-70**). In addition to land disturbed by construction along the pipeline rights-of-way, there would be additional acres disturbed by use of extra work space at road crossings and stream/canal crossings. The construction of seven or more aboveground pumping stations would affect about 35 acres of land during construction. An undetermined number of acres would also be disturbed by water treatment plant construction and temporary access roads.

Land dedicated as permanent right-of-way if all conveyance pipelines were constructed would be about 300 acres. An additional 15 acres would be required for the operation of the new pumping plants and an additional amount of acres for water treatment plants and the operation of permanent access roads. The permanent right-of-way would be maintained in a cleared, grassy condition or used for agricultural purposes, except as otherwise noted for wetlands, tree screens, etc.

Table 2-70 Refined Alternative 6 Acres Impacted by Construction and Operation of Lateral Pipelines			
Conveyance Pipeline	Length (miles)	Land Required for Construction (acres)	Land Required for Operation (acres)
Lemon Dam Lateral	9.6	58	29
Horse Gulch Lateral	2.1	13	7
Florida Mesa Lateral	8.0	48	24
Ridges Basin Lateral	3.8	23	12
Animas Industrial Park Lateral	7.1	43	21
La Plata Resort and Ranch Lateral	12.6	76	38
La Plata Housing Ranch and Lateral	12.6	76	38
Power Plant Lateral	32.0	193	96
La Plata Spur	1.0	6	3
Mancos Resort Lateral	1.0	6	3
Total	89.8	542	271

Pumping Plants

Seven pumping plants would be required, one for the Durango area, one for the Ridges Basin Resort and the Animas River Industrial Park, two to pump water from the La Plata River and Red Mesa, two to pump water from the San Juan River to the gas powerplants, and one for the resort development in Mancos Canyon. The typical pumping plant footprint would measure 15x25 feet, and would include a single story building to enclose the pump(s), an electrical power panel, and communications and gauging equipment. The entire facility is enclosed with a security fence, and a permanent access road is maintained to the facility. The land required for construction of the seven pumping plants would total about 35 acres for construction and 20 acres for operation.

Water Treatment Plants

At least four water treatment plants would be required for treatment of Animas, Mancos, Florida, and San Juan Rivers M&I water.

2.5.2.8 Land Requirements for Non-Binding Future Water Uses

The same future non-binding water uses are projected for Refined Alternative 6 as for Refined Alternative 4 (see Section 2.5.1.6).

2.6 COMPARISON OF REFINED ALTERNATIVE 4 AND REFINED ALTERNATIVE 6

Table 2-71 is a comparison of Refined Alternative 4 and Refined Alternative 6.

Table 2-71 Comparison of Refined Alternative 4 and Refined Alternative 6 on a Commensurate Level		
Parameter	Refined Alternative 4	Refined Alternative 6
Components of the two alternatives to provide up to 57,100 afy of depletions including evaporation losses		
Water Supply (depletions)	57,100 afy	54,865 afy
New Depletions	(57,100 afy)	(37,433 afy)
Historical Depletions		(17,932 afy)
Time to Implement This Component to Satisfy Colorado Ute Tribal Water Rights Claims	5 years	30 years
Ability to Satisfy Colorado Ute Tribal Water Rights Claims (primary reason for purpose and need of the project)	Would satisfy Colorado Ute Tribal water rights claims with little or no risk.	Would satisfy Colorado Ute Tribal water rights claims but contains a significant element of risk.
Most Significant Environmental Aspects	134 acres wetland impacts.	600 acres of wetland impacts. This assumes that 50% of wetland impacts can be avoided. This may be difficult to obtain.
Technical and Economic Aspects	Represents a conventional and assured solution.	More complex and risky solution. Land purchase opportunity and water yield are subject to considerable uncertainty.
Capital Costs to Implement Each Plan, Including the Acquisition of Water Rights	\$290.6 million. This cost has a high degree of confidence.	\$273 million. Significant elements of uncertainty associated with this alternative cost, including the escalating values of land and the assumption that significant potential losses in wetlands can be avoided.
Overall Risk	Little to no risk.	Considerable risk associated with purchasing land and water rights.

Table 2-71 (continued) Comparison of Refined Alternative 4 and Refined Alternative 6 on a Commensurate Level		
Parameter	Refined Alternative 4	Refined Alternative 6
Component to acquire 13,000 afy of historical depletions		
Purchase Land for Water Rights		
Pine River Basin	2,300 acres 3,220 afy	Not applicable
Animas/Florida River Basin	2,300 acres 3,220 afy depletion	4,643 acres 6,500 af depletion
La Plata River Basin	2,400 acres 2,160 afy depletion	Not applicable
Mancos River Basin	3,300 acres 4,290 afy depletion	Not applicable
McElmo Creek	Not applicable	4,062 acres 6,500 afy depletion
Amount of Land Purchased	10,300 acres	8,705 ac
Amount of Historical Depletions Acquired	13,000 afy depletion	13,000 afy depletion
Time Frame for Purchase	15 years	15 years
Risks Associated with Land Purchase	There are significant risks associated with purchasing 10,300 acres with the water acquisition fund. Not all land could be purchased in one year therefore land must be purchased over time. Land value inflation would apparently exceed interest earned in an interest bearing account. This would require that significantly more than \$40 million be deposited at the present time.	The same kind of risks as shown under Refined Alternative 4 would also occur with Refined Alternative 6. In addition, the purchase of 11,933 acres coupled with the purchase of 8,705 acres with the acquisition of water rights would add to the difficulty and risk of being able to purchase the required land and associated water rights.
Overall Assessment		
"	Refined Alternative 4 is a straightforward solution with little to no risk.	
"	The capital cost of Refined Alternative 4 at \$290.6 million is only slightly higher than the capital cost of Refined Alternative 6 at \$273 million. However, the cost estimate for Refined Alternative 4 is more reliable, while the cost for Refined Alternative 6 has risks which could add significantly to the cost estimate.	
"	Refined Alternative 4 could be implemented in a short time frame, whereas Refined Alternative 6 could take 30 years or longer.	

Further evaluation of Refined Alternative 4 and Refined Alternative 6 are contained in the remaining sections of this DSEIS. Chapter 3 contains an evaluation of the environmental impacts of each of these refined alternatives. Chapter 4 provides the analysis of how each of the refined alternatives impacts ITAs for not only the Colorado Ute Tribes, but also the Navajo Nation and the Jicarilla Apache Tribe. In particular, Chapter 5 contains additional evaluation of the ability of the two refined alternatives to meet the purpose and need of the project in being able to resolve the water rights claims of the two Colorado Ute Tribes. Chapter 5 includes a recommendation on a Preferred Alternative.